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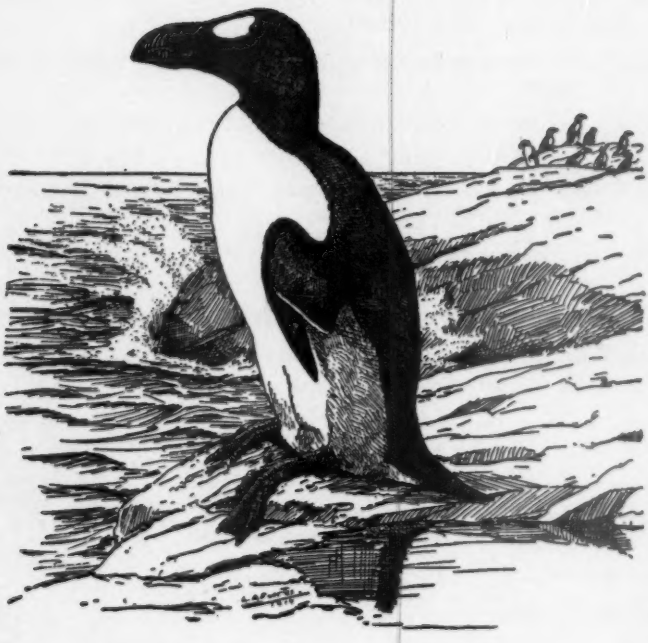

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STODDARD'S YELLOW-THROATED WARBLER, *Dominica d. stoddardi*; TYPE SPECIMEN: SEE PAGE 28.

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A QUARTERLY JOURNAL OF ORNITHOLOGY

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FAMILIAL RECOGNITION IN DOMESTIC BIRDS

BY A. O. RAMSAY

INTRODUCTION

THE auditory acuity of birds is well known. In addition, extensive work by Lashley (1916) and by Hamilton and Coleman (1933) has shown that the sensitivity of diurnal birds to color is almost as acute as that of man. Bingham (1922) presented evidence to show that birds are sensitive to size, brightness, and form, in that order. These and related studies were summarized by Maier and Schneirla (1935). However, it is not the purpose of this study to add to the extensive literature on this capacity of birds but rather to demonstrate that familial recognition, based on such cues as the above, may be acquired by both young and adult birds and need not necessarily be a function of inherent specificities alone. The position that recognition is based on a variety of such cues, variation of any one of which upsets the recognition behavior, has been previously assumed by Cushing (1941) in connection with mating preferences and by Davis (1942) as associated with individual recognition in social birds.

In a recent study, Cushing and Ramsay (1949) took the position that the recognition of parent and young need not necessarily depend upon inherent behavior patterns but could involve acquired determinants to a large degree. This is in accord with the theory of Lorenz (1935) who wrote: "In many types of instinctive behavior directed at fellow members of the species, the motor action itself is inborn but not the knowledge of the object of the act."

No anthropomorphic meaning should be attached to such terms as *recognize*, *avoid*, *attack* and so on. The word "recognition" is here used in a psychological sense to refer to a phase of memory.

The families of birds used in this study are summarized in Table 1. These families were all reared on 0.5-inch meshwire run-ways elevated three feet above the ground. These runs (2.5 by 1.5 by 6 ft.) were

provided with a shelter at one end and were covered with 0.5-inch mesh-wire cloth.

TABLE 1

FAMILIES OF BIRDS USED IN 1949

Female parent	*Age in years*	*Young*	*Color*	*Number lost in experiment*
	Group I.	*Young hatched June 12–13*		
A_1 White Muscovy duck	5	13 White Rock chicks	yellow	8
B_1 White Muscovy duck	2	6 Muscovy ducklings	yellow	0
C_1 White Rock hen	1	9 White Rock chicks	yellow	0
D_1 White Rock hen	2	6 Muscovy ducklings	yellow	0
	Group II.	*Young adopted June 18*		
A_2 White Muscovy duck	2	6 N. H. Red chicks	red-brown	1
B_2 White Muscovy duck	1	8 turkey poults	sepia	4
C_2 Barred Rock hen	2	15 N. H. Red chicks	red-brown	0
D_2 White Rock hen	1	12 turkey poults	sepia	2
	Group III.			
Female parent	*Age in years*	*Young*	*Hatching date*	*Number lost in experiment*
A_3 White Muscovy duck	2	6 White Rock chicks	Aug. 21	0
B_3 White Muscovy duck	5	7 Muscovy ducklings	Aug. 19	0
C_3 White Rock hen	1	6 Bantam chicks	Aug. 31	2
D_3 White Rock hen	1	6 Mallard ducklings	Aug. 29	0

Aggressive behavior on the part of the adult birds, notably pecking, and the avoiding and seeking reactions of the young were used to obtain quantitative indications of recognition. As preliminary studies showed that hens become more aggressive toward transferred young and Muscovy Ducks, *Cairina moschata*, less so, a 30-minute period was chosen as a fair duration for most of the tests.

I should like to thank Dr. John E. Cushing for his advice and criticism given throughout this study.

LEARNING

By adults.—In many species as the young birds grow older the adults become more active in repelling young of other groups that may approach them. Such behavior is vividly portrayed by Kirkman (1937) for the Black-headed Gull, *Larus ridibundus*. This aversion toward individuals of the species other than those of the immediate family group is regarded by many as one of the foundations of territorial behavior (Nice, 1941). Such behavior was also evident in the domesticated species studied. In these species, however, there was no evidence that the adults mothering them recognized the young individually, or that the species of young reared in one generation

conditioned the adults against rearing the young of another species in the next generation.

Considerable individual variation was evident in the activity of the adults toward transferred young. This was especially noticeable in the parent Muscovy Ducks. Some of these variations could be correlated with age and may be examples of facilitation or the improvement in the performance of an instinctive act by experience, as discussed at length by Nice (1943). This may also explain why Lorenz (1935) could not get a Muscovy to adopt Mallards, *Anas platyrhynchos*. Thus, for example, the first day the young chicks adopted

TABLE 2

LEARNING OF AVOIDANCE BY 16-DAY-OLD CHICKS

	Times attacked	
	First 10 minutes	*Second 20 minutes*
2 chicks from duck A_2 to duck B_2 with poults	28	1
2 chicks from hen C_1 dyed blue to hen C_1	69	20
2 chicks from hen C_1 dyed red to hen C_1	36	17

by duck A_1 were exchanged for the ducklings of duck B_1 (see Table 1), the widely experienced, 5-year-old Muscovy A_1 would not accept ducklings. This duck had previously mothered several broods of Muscovy ducklings, Mallard ducklings, chicks, and a mixed brood of chicks and ducklings. It is also interesting to note that this duck not only pecked at the transferred ducklings but that the call of a Muscovy duckling on one occasion served to release her defense reaction. She treaded rapidly up and down on the duckling beneath her. The heavy mortality of this duck's brood was caused by her great weight, but by the second day her chicks were expert dodgers and would scatter each time she took a step. This same duck later successfully hatched and brooded a group of seven Mallard ducklings. She led them to and from the nest twice on the first day. Young ducklings, removed from her at this time, returned. In contrast to this, a young Muscovy, also mothering Mallards, did not leave her nest until after all her brood but two had left the nest on the second day. If the young had been permitted to stray, it is quite possible that she might have lost them. Similarly, ducks B_1, B_2 and A_2, who also had never mothered young before, made no aggressive moves at all toward young transferred to them on the first day. Later in the course of the experiments, all these ducks became more active in attacking transferred young, yet the older, more experienced duck was more active in each case. Similarly, the older, more experienced hen D_1 was usually more active than the young inexperienced hen C_1. It must also be

noted, however, that the two-year-old hen C_2 pecked at the young transferred to her about twice as frequently as the one-year-old hen D_2 (32 pecks to 13) and that neither of these hens had ever brooded young before.

By young.—There is little doubt, therefore, that the factors determining specific recognition were largely acquired by the individuals concerned and not due to hereditary factors. This is clearly shown by the results given in Table 2. Here the number of attacks by the adult birds on the young have been presented to show that the young birds rapidly learn to avoid the adult that attacks them, even if this be the parent to which they have long been accustomed and which they have learned to recognize individually. This avoidance had been noticed on many occasions before this experiment was made. After such attacks, the young would retreat to the other end of the pen, attempt to hide beneath the other young birds present or seek shelter behind the food tray. Two of the cases presented involved young birds that were dyed in an aqueous solution of aniline dye, dried, and then returned to the parent that had mothered them for 16 days.

Reactions of Adults to Young

Transfers between the members of Group I (hatched June 13) showed that both the parents and the young birds were best able to recognize transferred members when they were unlike members of their own group. This was shown by the aggressive behavior on the part of the adult birds to members of a species different from their own young (Table 3) and by the avoiding reaction on the part of the young when dissimilar parents were used (Table 4). In these latter experiments, it was obvious that the avoiding behavior on the part of the young was the controlling factor rather than that the parents became used to the presence of the transferred birds. The young transferred to a parent similar to the adult to which they were accustomed sometimes made an effort to follow this bird; certainly they made no effort

TABLE 3

Aggressive Behavior of Both Real and Foster Parents to Transferred 4-Day-Old Young

Young transferred	*from mother*	*to female*	*mothering*	*Times pecked in 30 minutes*	
				transfers	*own*
2 ducklings	duck B_1	duck A_1	chicks	66	4
2 chicks	duck A_1	duck B_1	ducklings	32	1
2 chicks	hen C_1	hen D_1	ducklings	18	1
2 ducklings	hen D_1	hen C_1	chicks	23	0

to retreat from her. Young transferred to the adult of a species different from that to which they were accustomed made no effort to follow her and sometimes moved away at her approach. Further, in these exchanges, though transferred members were placed with the strange parent consecutively rather than simultaneously, the order was alternated in the different experiments with no effect on the results tabulated.

Early exchanges between the members of Group II (started June 18) seemed to indicate that one of the first bonds to be formed between parent and young, as might be expected, definitely involved vocal stimuli; this observation was confirmed by later experiments. Here, exchanges were possible on the second day so long as the young birds accepted the strange situation and remained quiet. The young birds were not attacked until they began calling for their parents. Thus, during the first 15 minutes the chicks in with hen D_2 who was mothering young turkeys were quiet, and one chick was brooded by the hen along with her own. Meanwhile the poults pecked at the chicks 13 times. Under these conditions the chicks withdrew to the other end of the pen and began calling. When the chicks called, on three different occasions, the hen left her brood and chased them about the pen pecking at them violently. The poults transferred to hen C_2 withdrew from this group after 10 minutes and were not pecked at by the chicks in this experiment, but the hen left her brood repeatedly and pecked at them 32 times. As a further check as to whether slight differences in color between the chicks and the poults might be an important clue to the adults, some of the young were dyed seal brown (tintex 29) and returned to their parents with no observable results. Note, however, that the experiments summarized in Table 6 show that more extreme deviations in color will also bring about aggressive behavior.

When the members of these families were older, the attacks by the parent birds on the young were more prompt and frequent. Thus hen D_2, mothering poults, chased two chicks from hen C_2 three times and pecked at them 17 times on the second day. Five days later, in the same time interval (the first 30 minutes together) she chased them 17 times and pecked at them 45 times. This indicates that time is involved in the learning of those characteristics used in recognition. This point has previously been made by Davis (1942) in connection with the recognition of the social companion. These results also suggest that the number of characteristics used in recognition also increase with familiarity. This conclusion was confirmed by later experiments.

RECOGNITION OF YOUNG BY SIZE

That the adult birds could distinguish the young by factors associated with differences in age was shown when White Rock chicks from a brooder were transferred to hen C_1 with White Rock chicks and to duck A_1 also mothering White Rock chicks. In these cases the comparative sizes were in the ratio of 1 : 2 in favor of the brooder chicks and 2 : 1 in the other. These results are summarized in Table 5. Note, however, that smaller differences in size bring about no aggressive behavior. In the last two cases presented, the age difference was five days and the ratio in size approximately 4 : 5.

RECOGNITION OF YOUNG BY COLOR

Strong evidence of the ability of the birds to recognize the young by color cues was observed in two series of experiments. First, some of the chicks from Group II were transferred to corresponding members of Group I (for example young from A_2 to A_1), and then some of the young ducks and chicks of Group I were dyed and returned to their parents.

A few of the New Hampshire Red chicks were colored more lightly than the others. In the first of the experiments a dark and a light

TABLE 4

AVOIDING REACTIONS OF 8-DAY OLD YOUNG

Young transferred	*from mother*	*to female*	*mothering*	*Times attacked in 30 minutes*	
				chased	*pecked*
2 chicks	hen C_1	hen D_1	ducklings	4	31
2 chicks	duck A_1	hen D_1	ducklings	5	15
2 ducklings	hen D_1	hen C_1	chicks	1	34
2 ducklings	duck B_1	hen C_1	chicks	2	0
2 chicks	duck A_1	duck B_1	ducklings	0	24
2 chicks	hen C_1	duck B_1	ducklings	0	2

chick were transferred simultaneously from hen C_2 to hen C_1 also mothering chicks. The darker (red-brown) chick was attacked 31 times in 30 minutes. The lighter (buff-colored) was not attacked during this same interval, though on several instances the hen arrested pecking motions toward it. This seemed to show that she recognized the lighter chick as somewhat strange but was willing to accept it. Transfers of dark and light chicks from Muscovy A_2 to Muscovy A_1 yielded similar results. The darker chick was pecked at 16 times in 30 minutes and the lighter chick was accepted. Transfers of chicks from Group I (White Rocks) to Group II (New Hampshire Reds showing considerable variation) yielded no results in the 30 minutes allowed. These differences in results may be attributed to the fact

that the parents in this case were accustomed to a greater variety of color in their broods.

Additional evidence that color is a strong cue in recognition was obtained when some of the chicks were dyed and returned to their parents. In each instance the dyed young were treated as if they were strangers to the group, though the adult birds showed great variability in the intensity of their reactions toward them. Meanwhile the young birds were pecking at the colored ones so constantly that it was impossible to record these observations in tabular form. Similarly, Bennett (1939) found that dyeing the breasts of Ring Doves, *Columba palumbus*, upset their recognition behavior. In this experiment some of the young were also thoroughly washed in water, dried, and returned at the same time as those washed in the dye solution. That these were not attacked suggested the conclusion that odor is not a cue in recognition in birds. This is in accord with the fact that birds are reported to be sensitive only to strong gases (Maier and Schneirla, 1935). Noble, Wurm, and Schmidt (1938) in more extensive studies, found no experimental indication that Night Herons, *Nycticorax nycticorax*, use odor in recognition.

TABLE 5

RECOGNITION OF TRANSFERRED CHICKS BY SIZE

Young transferred	*White Rock chicks*				*Buff-colored chicks*	
Number transferred	2	2	2	2	1	1
Age in days	30	8	30	8	7	7
To female[1]	hen C_1	hen C_1	duck A_1	duck A_1	hen C_1	duck A_1
Age in days of young	16	16	16	16	12	12
Size ratio	2 : 1	1 : 2	2 : 1	1 : 2	4 : 5	4 : 5
Times pecked in 10 minutes	18	26	51	12	0	0

[1] All females mothering White Rock chicks.

The reaction of the adult birds to 18-day-old chicks is shown in Table 6.

After these experiments the dyed birds were separated from the hens as preliminary experiments had shown that these adults become more violent in their attacks. Thus, in one such experiment, a hen mothering two-day-old chicks which were dyed red attacked those which were dyed blue and green immediately, but she did not attack those which were dyed violet until the next day. As the spectrum of the chick (Lashley, 1916) seems to be shortened at the violet end, this may represent recognition by brightness. The use of alcohol soluble dyes and of alcohol as a bath rather than water did not affect the results obtained in this experiment. The young in with the paren

TABLE 6

REACTION OF ADULT BIRDS TO THEIR OWN, BUT DYED, YOUNG

Young	*Female parent*	*Treatment*	*Times pecked in 30 minutes*
2 chicks	hen C_1	dyed methylene blue (Aq)	89
2 chicks	hen C_1	dyed red in eosin (Aq)	53
2 chicks	hen C_1	dyed pink in eosin (Aq)	1
2 chicks	hen C_1	washed in water	0
1 chick	hen C_1	control—no treatment	1
2 chicks	duck A_1	dyed methylene blue (Aq)	97
3 chicks	duck A_1	control—no treatment	2
2 ducklings	hen D_1	dyed methylene blue (Aq)	43
2 ducklings	hen D_1	washed in water	2
2 ducklings	hen D_1	control—no treatment	0
2 ducklings	duck B_1	dyed methylene blue (Aq)	4
2 ducklings	duck B_1	dyed red in eosin (Aq)	5
2 ducklings	duck B_1	control—no treatment	0

Muscovies were left with them as these same preliminary experiments had shown that aggressive action on the part of these adults dissipates itself by the end of the second day.

INDIVIDUAL RECOGNITION OF PARENTS BY VOCAL CUES

The ability of the young to recognize their parents by vocal cues was surprisingly acute. This was determined by an experiment in which the adult birds were confined in wooden nest-boxes 6 feet apart which were all new to all the birds concerned. These boxes (2 by 2 by 2 ft.) were placed on the ground in a pen that was also new to all the birds. The openings of the boxes were placed toward the fence so that the adult birds could be heard but not seen by the young, and a small opening was provided at the front so that the young could squeeze through to join their parents. After the adults were in position the young were transported in a cardboard box and released simultaneously from a point six feet away and equally distant from both nest-boxes.

First, hen C_2 with six 14-day chicks and hen D_1 with six 19-day ducklings were tried. Both hens were calling constantly and the young birds eventually joined their parents. Hen D_2 with three 14-day poults and hen C_1 with three 19-day chicks were then tested. In each instance the poults found their parents in less than an hour and remained with them during the next 30 minutes. The older chicks showed little inclination to join their parent in the time allowed.

In order that these results might be more carefully studied, hen C_3 with her brood of chicks and hen D_3 with her brood of Mallard ducklings were similarly tested on five successive days. On the first of

these tests, the two-day chicks found their parent in less than five minutes and entered the nest-box to join her. The four-day Mallards followed the chicks to this position but none entered the nest-box. In less than five minutes they left this position and went to the box containing their own parent. They remained beside this box during the rest of the hour and one duckling entered to join its parent. During these tests the young birds would move away at the approach of New Hampshire Red hens and Barred Rock hens that were allowed to roam the area unconfined. They did not retreat at the approach of White Rock hens but made no move to follow them. On one subsequent occasion, however, the Mallards followed a White Rock hen for a distance of eight feet. Two of the chicks also followed this same hen for two feet. As all these White Rock hens were brood sisters and, as this same hen was followed by both chicks and ducklings, it is possible that some undetected trait of behavior was the cue in this case. This hen was not calling.

The next day the experiment was repeated. On this occasion, as in all subsequent tests, the positions of the hens in the nest-boxes were reversed. Under these conditions, each group of young birds immediately went to the wrong box (position-response). Both groups reversed their positions, however, in less than 10 minutes and remained with their own foster parents during the rest of the hour. In the three subsequent tests with these groups no significant deviations from this pattern were noticed. Similarly, Nice (1943) found that young Song Sparrows, *Melospiza melodia*, recognize the calls of foster young Cowbirds, *Molothrus ater*, by the seventh day.

TABLE 7

RECOGNITION OF INDIVIDUAL, CONCEALED PARENTS BY AUDITORY CUES

Group of young tested	*Age*	*Parents*	*Number calling*	*Trials*	*Errors*
6 Mallards	2 days	hens	3	3	0
5 Mallards	2 days	hens	4	6	1
1 Mallard	2 days	hens	4	5	1
7 Mallards	5 days	Muscovies	2	3	0
2 Mallards[1]	8 days	Pintail	1	1	0
3 Mallards[2]	5 days	hens	2	5	1
2 Wild Turkeys[3]	5 days	hens	2	5	0.5
2 Wild Turkeys	2 days	hens	4	6	2.5
1 Pintail[3]	4 days	bantam hens	2	7	1
2 Ring-necked Pheasant, *Phasianus torquatus*	2 days	bantam hens	2	7	0

[1] These called in from the pond 50 feet away after several hours. In the meantime tended to join, but not to follow, the male Pintail.

[2] These two groups only conditioned by placing them with the wrong parents on the fourth day for four hours. See text. One poult went to wrong box, did not enter, and then slowly corrected error.

[3] See text.

Later experiments (1950) showed that the young birds could respond to the right parent promptly by the second to fourth day if only one group of young were tested at a time and even if the number of choices was increased to four. Four species (Table 7) of precocial game birds were used in these experiments and these species responded more promptly than did the domestic ones. The position of the similar parent birds was alternated as before and the young of all the parent birds were held near by so that all the adults were calling. Nevertheless, this response seemed to be facilitated by the fact that the parent adult called more loudly as its own young approached it. As before, young seemed to form position responses quickly. This largely explains the errors. Thus a four-day Pintail duckling, *Anas acuta*, twice went into a nest box that had previously contained its own foster parent although it was unoccupied at this time by either hen. These two trials and errors are not included in the table. Other results of this experiment are summarized in Table 7.

Responses of Adults to Behavior of Young

The adults tended to attack any young birds that retreated from them regardless of whether these were their own young or those of another individual. Thus, when in the experiment to be next described, three young Muscovies, that had been removed from their parent duck (B_3) after hatching, were placed in a pen containing parent Muscovies A_3 and B_3, they huddled in a corner by themselves and under these conditions were pecked at by both parents. Duck A_3 attacked them eight times and their own parent 16 times in a 30-minute period. When these ducklings were then placed in a pen with their entire family, parent and siblings, they merged with this group and no further attacks occurred.

Similarly, two four-day game farm Turkeys, *Meleagris gallopavo*, mothered by a New Hampshire Red hen were exchanged for five four-day Mallards also mothered by a New Hampshire Red hen. During this four-hour period, the young birds were chased and pecked by the adults repeatedly. When the two hens were then returned to their own broods, the Turkeys continued to run from the parent hen and their own parent continued to chase them. This hen, however, arrested all pecking motions toward them and, when the pen was darkened after 15 minutes, she called the young to her and brooded them as before.

These experiments suggest automatic responses to behavior rather than recognition by individual traits. Likewise, Davis (1942) found no evidence that behavior patterns are used in recognition.

RECOGNITION CUES REVEALED BY MEMORY TESTS

Three Muscovy ducklings were removed from their parent duck, B_3, at 10 a. m. August 19, 1949, a few hours after hatching. They were carried 0.25 miles away and their ability to recognize the call of their parent was tested every two days in a manner similar to that previously described. These tests lasted one hour. When they were two days old, they responded repeatedly to the call of duck B_3 in preference to that of A_3 from a distance of 25 feet. During this same test period they would run to follow any white bird that approached them closely (Snow Geese, *Chen hyperborea*, Muscovy ducks and drakes, and White Rock hens), but they did not move to follow birds that were not colored white (Canada Geese, *Branta canadensis*, buff-colored hens, and Blue Geese, *Chen caerulescens*). Similar results were obtained on the fourth day, although the distance had to be reduced to 12 feet to bring about a response. By the sixth day they showed no ability to select between the calls of A_3 and B_3 or inclination to respond to the call of either duck, though they would still follow for some distance any white bird that approached them. Somewhat similarly, Noble, Wurm, and Schmidt (1938) found that members of pairs of immature Black-crowned Night Herons could recognize their mates by vocal cues alone after an absence of about four days.

These experiments indicate that in the species studied auditory cues predominate in individual recognition of the parent and that recognition based on such cues is more exact than that based on form, color, or size. This observation is in accord with Huxley's comments (1942) on species recognition factors. Huxley emphasized, for instance, that though the Eastern and Western Flickers, *Colaptes auratus* and *C. cafer*, which differ widely in color and markings, commonly interbreed where their zones have secondarily come to overlap, the Eastern and Western Meadowlarks, *Sturnella magna* and *S. neglecta*, which differ primarily in song pattern, rarely interbreed.

THE INHERENT PATTERN OF THE PARENT COMPANION

Lorenz's studies (1935) indicated that the innate perceptory pattern of the parent companion may, in many cases, be very simple. Conversely, this leaves much to be filled in by learning. Several experiments indicated that such simple elements in the external situation may serve to release the responses of the young. In the first of these experiments, incubator-hatched birds were liberated three feet from pens containing parent females of the species to be mentioned. With few exceptions, these young were hatched in isolation in the incubator. Mallard E (see Table 8) was inadvertently hatched with Muscovy

duckling C. This may possibly explain the aberrant behavior of this Mallard. The young of all the parent birds were removed from them during the experiments so that all the adults were actively calling.

TABLE 8

RESPONSE OF INCUBATOR-HATCHED YOUNG TO ADULTS OF SEVERAL SPECIES

Species	*Age in days*	*Total tests*	*Number of responses to*			
			Hen	♀ *Muscovy*	♀ *Mallard*	*Others*
A Muscovy	1	15	10	4	—	1
B Muscovy	1	18	1	5	—	12 to Human
C Muscovy	2	20	4	9	—	7 to geese
D Mallard	1	20	5	7	—	8 to Human
D Mallard	3	14	4	1	4	5 to Human
E Mallard	2	18	1	17	—	0
E Mallard	3	30	0	30	0	0
F Mallard	1	17	4	1	4	8 to Human
G Mallard	2	11	0	5	3	3 fear response
H Mallard	0.5	20	14	5	1	0
I Chick	1	20	20	0	0	0
I Chick	1	10	—	0	10	0
J Chick	1	21	20	1	0	0
J Chick	1	18	—	0	17	1 to Chukar Partridge
K Chick	0.5	20	20	0	0	0
K Chick	0.5	13	—	2	10	1 to Chukar Partridge

The results of these tests are shown in Table 8. Of all the species studied, only the domestic chick seemed to be able to respond to the correct biological object. Yet it must also be noted that when no parent hen was present, these same chicks later responded almost as consistently to the call of a Mallard Duck. Other responses of these chicks were to the calls of a Chukar Partridge, *Alectoris graeca*, caged much further away. These same chicks made no response to hens that were not calling. Many of the chicks made no response on the first trial until a lapse of five minutes or more. Thereafter, most of the chicks responded rapidly. Younger birds, after a few trials, refused to respond.

These experiments indicate that in all the species studied, except the domestic chicken, the innate perceptory pattern of the parent companion is non-specific or indeterminate. The chicks showed an innate ability to respond to the biologically correct object, but the data summarized in Table 9 indicate that this perceptory inlet is far from completely determinate and that the acquired bond is stronger than the inherent one. The data in this table also indicate that the bond of the young to the parent-object becomes increasingly strong through association and habit formation and would thus seem to indicate that the parent-young bond is not a simple reflex formed at the time of hatching.

TABLE 9

BEHAVIOR OF SIX CHICKS TOWARD BOX AND CLOCK AND TOWARD PARENT HEN*

Age	*Behavior toward box and clock*	*Behavior toward parent hen*
1 day	Hovering. Contented chirping. Would not follow. Froze at any rapid motion of box.	Two went toward parent in 4 minutes. Others in 12. None found hen.
2 days	Followed box for 25 ft. Fled to box rather than to hen when alarmed. Contented chirping. Froze at rapid motion of box.	All went toward hen. Two joined hen for short interval. None remained with hen.
4 days	Followed 17 ft. Froze at rapid motion of box. Four followed box in preference to hen.	One went to hen 7 times and returned. Two followed hen for a total of 15 of 30-minute test period.
6 days	Followed 15 ft. Stayed near box. All followed box in preference to hen.	One went to hen 7 times; another, 3 times. These 2 followed hen for short interval.
8 days	Followed 15 ft. Stayed near box. All followed box and clock rather than hen.	Hen free, 1 chick followed hen for 3 feet only.
10 days		Normal behavior when added to group.
12 days		Two nearly killed by hen.

* Thirty-minute test periods with each. Hen caged three feet away unless otherwise noted.

In this latter experiment an inanimate substitute object was used in place of the parent. The young chicks were hatched in an incubator with a green box (5 by 6 by 8 inches) containing a ticking alarm clock and suspended high enough above the eggs so that the young could form contact with it while hovering. A six-watt bulb incorporated in the incubator gave moderate illumination at hatching. When the young were dry, they were transferred to a larger box (2.5 by 2.5 by 3 feet) and kept beneath the same substitute object. Heat was provided by a 40-watt bulb over this pen, and food and water were kept for them in this same box. The tendency of the young to follow this substitute-object was tested at two-day intervals. The substitute object was attached to a cable stretched between two trees and made to move by a cord attached to it (Plate 2).

The responses of the young of several other species to this same substitute object were tested in a similar manner. In addition, a football was used in other experiments as a substitute object having different characteristics. The results of these experiments are summarized in Table 10.

These experiments would seem to indicate that the innate perceptory pattern of the parent companion in the Muscovy duckling may involve the visual modality alone. Muscovy ducklings, when given a choice of parents of several species, responded at random (Table 8). Many responses were also made by these ducklings to Canada Geese, *Branta canadensis*, which gathered near by during the experiments and which were not calling. Muscovy ducklings responded to the football as a substitute object but not to the box and clock. The innate perceptory pattern of the parent companion in the chick would seem to involve the auditory modality alone. Chicks did not respond to adults that were not calling (Table 8) but responded to the box and clock combination as a substitute object. They did not respond to the football (Table 10).

TABLE 10

RESPONSE OF YOUNG OF SEVERAL SPECIES TO SUBSTITUTE OBJECTS

	Chick	*Mallard*	*Muscovy*	*Canada Goose*
Groups tested with football	2	2	2	1
Response	0	0	2	1
Groups tested with box and clock	3	3	2	1
Response	3	0	0	1

The innate perceptory patterns of the parent companion in the Mallard Duck and the Canada Goose were not determined. Canada Geese responded to both substitute objects. Both of the goslings responded to the call of their parents in preference to the substitute objects at first, but rapidly learned to avoid their family group after having been attacked—the 1949 gosling after one such attack, the 1950 gosling after three such attacks (Plate 2). Both goslings were individually recognized by their parents by the fifteenth day but not appreciably earlier. Neither of the two experimental goslings has yet merged with the other Canada Geese.

These latter experiments were suggested by Dr. David E. Davis. They will be reported on in more detail in a later paper. The accompanying photographs were taken by Mr. Leland A. Graham of the McDonogh School faculty.

SUMMARY

This is a study of domestic birds and their offspring to demonstrate that various factors are used by them in recognition which is understood here as an aspect of memory.

Domestic birds were reared by females of their own and of different species. Twelve families were established—ducks with chicks and poults and ducklings, and hens with similar groupings. Duplicate

groups of those above mentioned were also established. Exchanges of young from one group to another were used to obtain quantitative measures of recognition. Aniline dyes were used to establish the presence of recognition by color, and a multiple-choice technique was devised to demonstrate that the young of different species could find their specifically similar, hidden parents by vocal cues alone.

That the factors determining specific recognition were largely acquired was shown by the avoidance by the young of adults unlike the species to which they were accustomed. The young birds also learned to avoid the adults that attacked them even though these were the parents that had reared them. Such learning was mensurable in a 30-minute test period. Parent birds chased and pecked at young unlike the ones they had adopted, even though the transferred birds belonged to their own species. Transferred young were not attacked on the first day by three inexperienced ducks though one experienced duck attacked young ducklings transferred to her in less than 12 hours after the hatching of her brood of chicks. Hens learned more rapidly.

The parent birds attacked young unlike the ones to which they were accustomed regardless of species. Specific differences in voice were recognized by both the adults and young by the end of the first day. Transferred day-old birds in two cases were not attacked by hens until they began calling for their own parents. Two-day-old young quickly found their own parents, even when they were hidden from them and were forced to choose between other adults of the same species. Comparative studies with four species of precocial game birds gave similar results, even when the number of hens calling was increased to four. Parent birds were correctly identified by vocal cues by the second day and probably sooner. Marked differences in color resulted in pecking and chasing even when the young birds were dyed and returned to their own parents. This discrimination by color also appeared by the second day. Shades and tints did not upset recognition behavior. Marked differences in size were also recognized.

Muscovy ducklings, removed from their parent a few hours after hatching, could recognize their parent by vocal cues four days later. They remembered her color even longer but showed no memory of her size or form.

The response of incubator-hatched young to parent females of several species was tested. Only the domestic chick showed any inherent ability to respond to the biologically correct object. When no parent hen was available to them, these same chicks later responded to Mallard Ducks.

The response of incubator-hatched young of several species to inanimate objects, substituted for their parents, was also determined. Chicks and goslings of the Canada Goose followed a small green box containing an alarm clock. Muscovy ducklings and goslings responded to a football. Mallards responded to neither of these objects.

The above work makes it seem probable that in several species of birds both the adults and the young largely acquire, rather than inherit, the ability to recognize other members of the family to which they belong using color, voice, size and form as cues. Recognition seems to involve several factors, variation in any one of which upsets the recognition behavior of adults and young. In the species studied, auditory cues seem to predominate in recognition, but it is also apparent that these are far from being the only cues involved.

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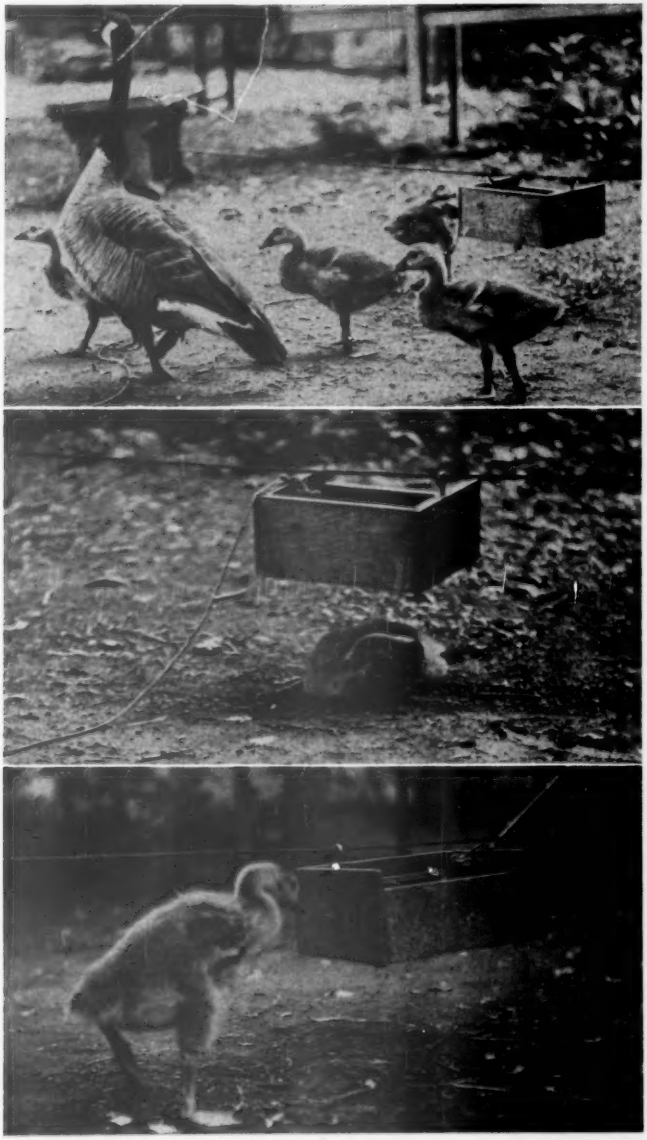
McDonogh School, McDonogh, Maryland, July 11, 1950.



(*Top*) ACQUIRED RESPONSE OF EXPERIMENTAL 21-DAY GOSLING, MALE PARENT AND SIBLINGS. (*Middle*) HOVERING RESPONSE OF 21-DAY GOSLING TO SUBSTITUTE OBJECT. (*Lower*) FOLLOWING RESPONSE OF 21-DAY GOSLING TO SUBSTITUTE OBJECT.

BOARDMAN CONOVER, 1892–1950

BY STEPHEN S. GREGORY, JR. AND A. L. RAND

BOARDMAN CONOVER was an ornithologist linking the days when private bird collections were of world importance and the present era when most important collections are in public institutions. By specializing in game birds, which for him included cranes, rails, tinamous, shore birds, doves, gallinaceous birds and ducks, Conover was able to build up an outstanding collection with a world coverage, and these he housed, and worked on, in the Chicago Natural History Museum. His modesty and his retiring habits limited the number of those who knew him well. But he was an excellent host, and his occasional game dinners at his apartment were a feature of the ornithological world in Chicago, both to local and visiting bird men. A wealth of correspondence with people in all parts of the world kept a stream of selected specimens trickling into his collection.

(Henry) Boardman Conover was born in Chicago, January 18, 1892, the youngest child of Charles Hopkins Conover and Della Louise Boardman Conover. He had three sisters: Elinor (now Mrs. Ralph W. Owen of Eau Claire, Wisconsin), Della B. (now Mrs. Eugene S. Talbot of Chicago) and Margaret B. His father was born in Easton, Pennsylvania, July 12, 1847, and moved to Chicago in 1871, where he engaged in business and became president of the hardware firm of Hibbard, Spencer, Bartlett and Co. The name Conover evolves from Van Couwenhoven, and Wolfert Van Couwenhoven was the first member of the family to settle in America, coming from Amersfoort, The Netherlands, in 1630. His mother was born in Marietta, Iowa, October 31, 1859. Her father, Henry E. J. Boardman, was a lawyer, who before moving West graduated from Dartmouth and taught for a time in an eastern college.

Conover's preparatory education was received in the Chicago Latin School and the Hill School, Pottstown, Pennsylvania. He then attended the Sheffield Scientific School at Yale, receiving the degree of Ph.B. in 1912. His training was in civil engineering, and in this capacity he served with the United States Reclamation Service in Las Cruces, New Mexico, from 1912–1913, and then practiced engineering for a short time with the Pennsylvania Railroad, living in Pittsburgh, Pennsylvania. This was followed by a few years of business experience with the Stewart Manufacturing Company in Chicago. Then in World War I he served overseas in France, as 1st Lieutenant in the

332 Regiment of Field Artillery with the 86th Division of the United States Army.

From early boyhood Boardman Conover had been interested in living things. As such boys do, he collected cocoons and birds' eggs, and kept pets which ranged from white rats to parrots and chameleons. His father, a successful business man, had no interest in hunting, or in wildlife. But he was sympathetic with his son's interests and encouraged him in many ways. He provided him with a variety of pets, and from the time he was nine years old sent him to a boys' camp in Wisconsin for part of each summer. Books were one of his father's main outside interests, and this is reflected in his having handsomely bound some of the early bird pamphlets his son secured.

Late in 1904 Boardman's father introduced him to Fred Surkamer, the head gunsmith for Hibbard, Spencer, Bartlett and Co. This was a contact of far reaching importance. The immediate result was a special shotgun to fit the frame of the 12-year-old boy. But also Boardman and Surkamer became friends and soon Mr. Conover planned a shooting trip for the two. It was Surkamer, a man of high ideals and a capable sportsman, who taught the boy to shoot; instilled in him the rules and ethics of the game, and directed his awakening interest in sport. In line with this, Boardman's father, in 1914, arranged for his son's election to the Swan Lake Club, Illinois, where he continued to shoot ducks each fall.

His guns, his bird dogs, his bird shooting, and his library of sporting books were interests that continued throughout his life. As a young man all his spare time was spent with them. His shooting records, in which every day's bag is entered with date, place, gun used, and the number of individuals of each kind of game begins with one gray squirrel shot in Virginia on November 16, 1904 (when he was 12 years old) with a borrowed gun. The next year, on April 5, 1950 (spring shooting was legal then) is entered his first bag of birds—one Lesser Scaup and two Coots shot with his own 16-gauge Parker in Illinois.

From then on not a year is missed in the record. Before he was out of school he had ranged as far afield as South Dakota for ducks, and Wyoming for Sage Grouse. In later years he travelled to Texas, Utah, South Dakota, and Saskatchewan for game birds. For the period he was on active service in France the record is tenuous, but it includes such things as the European Woodcock and the European Coot. It continues until 1950, when the Bob-white Quail shot during his last winter in Florida are entered.

Big game interested him little. Though in 1919 and 1920 he travelled to Yukon to shoot sheep, caribou, bear, and moose he took a

shotgun and shot birds whenever possible. In mentioning certain aspects of these trips, important points that came to his mind were of specimens he had been unable to shoot because the guide feared the shots would alarm big game.

It was probably in 1919 that Conover met Dr. W. H. Osgood, then assistant curator of mammalogy and ornithology of the Field Museum as it was known at that time. This was a turning point in Conover's life. Not particularly happy in business, and with means enough to make it unnecessary for him, a new and more satisfying life appeared for him. Hitherto his interests in game birds had been that of a sportsman. Under Osgood's influence he learned how to collect and study them. The first fruit of this was a collecting trip for the Museum to Venezuela in early 1920, with Dr. Osgood. It was on this trip that Conover, who did the game bird collecting, learned to make scientific specimens. In 1918, in the diary of his Yukon hunting trip he writes of attempting to make bird skins, but most of them were thrown away. Apparently only a single specimen survived these efforts, a Willow Ptarmigan. But on the Venezuela trip, under Osgood's tutorage, Conover made a collection of 133 specimens. The next step was study of the material collected and with Osgood he prepared a report on the collection, that was subsequently published. This confirmed his decision to abandon business and to embark on ornithology as a full-time career. As he wrote Osgood about this time, "During our recent trip to Venezuela I became seriously interested in the formation of a special study collection of game birds." In July, 1920, arrangements were made whereby the collection was to be housed in the Chicago Natural History Museum (then the Field Museum), which proved to be its permanent home. Thus was the collection started. Conover's next trip, in the autumn of 1920, was to Yukon, ostensibly for big game, but birds received more attention than did big game, and a collection of just over 100 bird skins resulted.

Two years later, in 1922, Conover took part in another Museum expedition to South America, again with Dr. Osgood and with Mr. Colin C. Sanborn (now curator of mammals). After spending some time in Chile they left Mr. Sanborn there, and Dr. Osgood and Conover went on to collect in Argentina; they made a short stop, but did no collecting, in Brazil on the way home in 1923.

In 1924 Conover spent the spring and summer in the Hooper Bay area of Alaska with Mr. H. W. Brandt of Cleveland and Mr. O. J. Murie. Here Conover specialized in game birds, especially downy young, and published the results of this trip in 'The Auk' for 1926. In January, 1925, he made a short trip into Mexico.

In 1926 Conover, in cooperation with Mr. R. H. Everard of Detroit, financed an expedition to east Africa, on which they were accompanied by Mr. John T. Zimmer, then assistant curator of birds of the Museum staff, and collected in Tanganyika Territory, Belgian Congo, and Uganda, leaving the country via Mombasa.

Expedition life, much as he enjoyed it, was not for Conover. His health ruled it out. He was never really well after his African trip. On it he had an attack of what was diagnosed as intestinal malaria, and this continued for many years a drain on his strength. He developed asthma about 1942 and it became progressively more severe. Neither the high altitude of Wyoming nor the damp air at sea level in Florida gave him any real relief. Except for a short trip, by plane, to Mexico in March, 1931, he did not again leave the confines of the United States and Canada.

But by 1927 his collection numbered more than 6000 specimens of 700 species. By judicious purchase, financing collectors, and exchanges it continued to grow. Conover was ever alert to know of new collectors, people he could write to in areas from which he wanted birds, the location of rare and desirable specimens and persons who would collect about their own localities or make small expeditions into fruitful areas.

As Conover's interest was game birds, sportsmen, army officers, missionaries, a host of people over the globe, anyone interested in shooting might recognize and know from descriptions his special needs. It necessitated a lot of letter writing, but it was productive. He sometimes said that if he got specimens from but a small proportion of the people to whom he wrote, he thought he was doing well. It was thus he got many of his specimens, and even at the time of his death there were on the way to him collections from small expeditions he had financed in Nepal and Colombia.

The Conover collection of game birds contains about 18,000 specimens, including about 30 types. In certain groups, such as the francolins of Africa, Conover considered it to have the best representation extant.

Conover joined the American Ornithologists' Union in 1920 and was elected a Fellow in 1947. He was also a member of the British Ornithologists' Union, the Cooper Ornithological Club, the Wilson Ornithological Club, American Geographical Society and the Biological Society of Washington. In Chicago he was a member of the University Club of Chicago, the Camp Fire Club of Chicago, the local naturalists' group known as the Kennicott Club, and was a Trustee of the Chicago Zoological Society. In meetings Conover was extremely

Sincerely
Boardman Conover

reticent in expressing his views but, as those who talked with him knew, he had sound ones. His modesty was such that he hesitated to try to force them on others. Only once did he present a paper, to the Kennicott Club, on the birds of Hooper Bay, Alaska, after his trip there in 1924.

Throughout his ornithological career Conover worked closely with the Chicago Natural History Museum where his collections were housed. He never married. He and his sister, Margaret, lived together in an apartment in Chicago during most of his life, and her sympathetic understanding and unselfish advice contributed greatly to his accomplishments. Here in his apartment he had a study where his business and much of his correspondence were carried on. But daily when in Chicago he came into the Museum to work with his collection. In 1924 he was placed on the staff as an honorary associate; in 1936 he was appointed research associate. In 1940 he was invited to a place on the Board of Trustees of the Museum where he served until his death.

While Conover's main interest was in game birds, he was generous in the extreme in purchasing general collections, keeping the game birds for his own collection and donating the non-game birds to the Museum; if, as he used to say, 10 per cent of the collection was game birds he was satisfied and the Museum benefited richly through this. Through many such gifts he variously became a Patron, a Corporate Member, and finally on his death when his collection, his library, and a fund to support bird work came to the Museum, a Benefactor. The exhibition hall of birds which contains the systematic series has been dedicated as the Boardman Conover Hall.

The facts of occurrence, identification, and variation rather than theories interested Conover. His methods of working, with a card index of his collection, and an interleaved, annotated British Museum Catalogue enabled him to tell in a moment what was in his collection, what had been described, and gave him the pertinent references.

Thoroughness and conscientiousness marked his work. He spared no effort in gathering material, and whenever possible borrowed types for comparison. Mistakes and discrepancies in published works bothered him greatly, and he tried to avoid them in his own. His main interests were in his collection. The problems on which he published were directly related to it, especially when he could not lay out specimens so that they fitted published data; then he published, forced to it as it were.

Conover's publications numbered about 38. Two of these dealt with his expeditions, the one to Venezuela, the other to Alaska. Most of

his other papers were descriptions of new forms or revisions of species. In all he named about 20 new forms. Conover's greatest work was the completing of the final four volumes of the "Catalogue of the Birds of the Americas." This "Catalogue," begun by Charles B. Cory who completed two volumes, was continued by Hellmayr until his death in 1944.

Conover's friendly association with Dr. Hellmayr at the Museum, at first perhaps more admiration for his knowledge and attainments, ripened into a deep friendship. To complete the "Birds of the Americas" became a labor of love. The 15 volumes of this classical work, an indispensable tool of the working ornithologist, remain a monument to Cory, Hellmayr and Conover.

Conover's library was not extensive; he depended on the Museum library for most of the necessary reference works and helped in their acquisition. He had a few standard works such as the British Museum's "Catalogue of Birds," the game volumes of which he had interleaved and kept annotated up to date, and pertinent reprints from certain publications, which he kept arranged by journals. The balance was largely composed of fine books well illustrated dealing with game birds, hunting, and dogs.

His love of shooting and of dogs continued throughout later life. Each autumn he spent a few days duck shooting at Swan Lake in Illinois, and he always had a few bird dogs boarded near the city, which he visited weekends. For many years after joining the Museum he made longer hunting trips afield, to the Dakotas or the Canadian Prairies for upland shooting. But in recent years, partly because of poor health, he abandoned these and parts of each winter were spent in milder climates, often in Florida, where he enjoyed quail shooting and fishing. Though these were sporting trips he sometimes saved unusual or fine specimens, and on one of his last trips to Swan Lake in 1949 he brought back a bird whose plumage indicated it to be an intersex Mallard, and had a formal dissection in the bird division to settle the matter. With the restriction on local hunting and decrease in quality, he tried shooting on local pheasant preserves, but he found it a poor substitute for the wider fields he had hunted.

Though long troubled with asthma and digestive trouble, his death on May 5, 1950, from heart failure brought on by pneumonia, at Passavant Hospital, Chicago, came as a surprise as well as a shock to his friends.

To properly evaluate a man at close range, in both time and space, is difficult. The Conover we knew was a man of steadfast purpose and persistent industry, a conscientious worker who asked little, but gave

freely when asked, and an authority in his chosen field. His memory as a cheery friend, and an unassuming and congenial colleague may fade. His papers, even the monumental "Birds of the Americas," will go out of date. But the Conover collection of game birds will be consulted and studied through the years by others, and his efforts in bringing them together will be a hidden part of much future scientific work.

Box N., Winnetka, Illinois, and Chicago Natural History Museum, Chicago, Illinois, August 11, 1950.

THE NESTS AND EGGS OF *MESOENAS UNICOLOR* OF MADAGASCAR

BY A. L. RAND

THE special interest attached to this bird is that it is one of the three species (the other two are *Mesoenas variegata* and *Monias benschi*) included in the peculiar Madagascar family Mesoenatidae. Lowe (1924: 1151) suggested that this family of small, generalized and primitive birds might merit having a separate order erected for them, but he recognized gruiform relationships, and currently it is placed usually as a family of the Gruiformes.

The nest, but not the eggs of *Mesoenas unicolor*, was described by Milne Edwards and Grandidier (1879: 603) under the name *Mesites variegata* and somewhat differently by Lavauden (1931: 395–400).

When Mr. Harry Hoogstraal was in Madagascar in 1948 with the Blood Survey Group, Office of Naval Research, United States Navy, his party found two nests of *Mesoenas unicolor* and collected the eggs and the parent birds. These have come to the Chicago Natural History Museum along with Mr. Hoogstraal's notes on the nests; they permit certain additions to the knowledge concerning this bird. These nests were found at Bemangidy, Poste Mananteina, Fort Dauphin district in the extreme southeastern part of the island. Bemangidy is 72 kilometers north of Fort Dauphin and is about five miles west of the Indian Ocean. The country is hilly and apparently was originally covered with rain forest, though part of this is now being cut down. Both nests were in the rain forest where a thin cover of shrubs and few herbs grew below the trees. The nests were about a half-mile apart. Each nest was in a fork of a sloping tree, one about three feet above the ground, the other almost six feet above the ground. In each case the lower trunk of the tree had a number of low branches on it, on which it might have been possible for the bird to hop up to the nest.

The two nests were platforms of slender, interlaced twigs, four or five deep, with sides of one or two slightly larger twigs and were lined with a very few, long-petioled leaves, a few lengths of a grass-like plant, and in one a bit of moss. One nest measured 220 millimeters across, the other 245. Each of the two nests contained a single egg. The eggs are nearly bluntly oval in shape; one egg has the ends about the same shape, the other egg has one end slightly more tapered than the other; the texture is fine, with a slight gloss on one egg, a moderate gloss on the other; the ground color is dull whitish, lightly tinged greenish-grey in one egg, buffy-gray in the other; the markings are confined to half of the egg, tending to form a wreath about one end, and are deep chocolate brown or secondary grays overlaid with shell color; the markings are in the form of a few big irregular spots on one egg, and sparse spots and dots; in the other egg, they are rather densely spaced small spots and dots. The eggs, both cracked specimens, measure 45 by 30 and 43 by 30.5 millimeters.

In both cases the incubating birds, which were females, were on the nest. They did not move when approached, and both were easily captured. One nest was found on November 24, the other on December 25, 1948. The natives who saw these specimens referred to them as rails, but said they had not seen this particular kind before. Both birds had lice amongst the feathers, and microfilaria and trypanosomes in the blood. Mr. Hoogstraal will report on this aspect of the birds in connection with other work.

Mesoenas unicolor has been considered a bird of the central part of the forests of eastern Madagascar (Rand, 1936: 364) and many of the skins in museums come from the forest of Sianaka. The present specimens, two females (wing, 118 and 120 mm.) compared with a male and a female from the forest of Sianaka (wing: male 116; female 118) differ only slightly from the Sianaka female in having the upper parts generally slightly deeper brown, and the top of the head somewhat darker; one has the upper breast somewhat brighter red-brown. The same differences are apparent in comparing the above two females with the Sianaka male, except that there is little difference in head color.

With the above factual data it is interesting to make some comparisons on various biological aspects of the family using the work of: Milne Edwards and Grandidier (1879: 603) who described the habits of *Mesoenas unicolor* under the name of *Mesites variegata;* Lavauden, (1931: 395–400) who described the nest of *Mesoenas variegata* and *Monias benschi* and summarized what we know of the biology of the family; Lavauden (1932: 632–633) where he added a few more details;

and Rand (1936: 364–368) who described the habits of *Monias benschi* and recorded two specimens of *Mesoenas variegata*.

All three species are ground birds which do not fly or fly poorly; probably all eat insects and fruit, as does *Monias benschi*. They are all geographical representatives but so different that their classification as three species in two genera is well founded. *M. unicolor* is a bird of the rain forests of the eastern part of the island (Oriental Province); *M. variegata* occurs in the scattered areas of dry forest in the western and extreme northern part of the island (Occidental Province, both Western and Northern Savanna Districts); and *M. benschi* lives in low brush forests of the southwest (Suddesert Province). Though *Monias benschi*, at least, may be very common at certain places (it goes in bands, while *Mesoenas* is found solitary or in pairs) the distribution of all three species seems to be very local, judging by the many collecting stations where the species have not been found.

The nest of *M. unicolor* was described by Milne Edwards and Grandidier (1879: 603) as on the ground, but Lavauden (1931: 398) said it was in a bush, and this accords with our new information. Apparently all three species make similar nests—flat, rather scanty structures of sticks with scant lining placed within a meter or two of the ground. Presumably these nests can be reached by the birds, without flying, by hopping from branch to branch or along the trunk. The number of eggs for *M. variegata* was given by Lavauden (1931: 399) as two to three in a clutch, and he collected one set of two. For *M. benschi* the number of eggs was given by Lavauden as two, and he collected one set. However, Rand (1936: 367) gave the clutch size for *M. benschi* as one egg, and this new data for *M. unicolor* also shows a clutch size of one. We can assume one to three eggs per clutch is the variation in the family. The eggs are apparently similar in the three species, in size varying from 33 by 26 millimeters for *M. variegata* (Lavauden, 1931: 397) to 45 by 30 millimeters for *M. unicolor*, with those of *M. benschi* intermediate in size. The young of all are precocial. In *M. variegata* and *unicolor*, they are covered with blackish down, like a rail (Lavauden); in *M. benschi*, they are brown and whitish. Their method of reaching the ground is not known.

Rand (1936: 367) had indicated that in *Monias benschi* there is a preponderance of males, and that the males incubate the eggs and care for the young. As Hoogstraal sexed the two incubating *Mesoenas unicolor* as females, this does not appear to apply to this species.

The dates of the two nests of *M. unicolor*, November and December, agree in general with the October nesting dates of *M. variegata*, (Lavauden, 1932: 632), and the December breeding period of *M. benschi*,

Rand (1936: 366) and Lavauden (1932: 633). This falls in the normal breeding period for most Madagascar birds, in the rainy season.

Mesoenas unicolor is said to be taboo to some natives, and the taboo extends even to uttering its native name Roatolo. Hoogstraal found no evidence for this in the Fort Dauphin area, and there seems to be no such taboo connected with *M. variegata* (called Fangadehovy) or *M. benschi* (called Nak, Naka or Nahka by the natives).

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Chicago Natural History Museum, Chicago, Illinois, September 1, 1949.

A NEW RACE OF YELLOW-THROATED WARBLER FROM NORTHWESTERN FLORIDA

BY GEORGE MIKSCH SUTTON

SOME years ago, when I was on the staff of the Carnegie Museum in Pittsburgh, Pennsylvania, I noticed that all the specimens of Yellow-throated Warbler, *Dendroica dominica*, collected by W. E. Clyde Todd and W. W. Worthington at Whitfield, Walton County, Florida, seemed to have exceptionally long, slender bills. Wondering whether these might belong to an undescribed race, I proceeded to examine specimens of *Dendroica dominica* in various museums and to collect fresh material as opportunity offered. Eventually I amassed a considerable series in my own collection: five males from eastern Oklahoma; two males and one female from Georgia; one male from Tamaulipas, México; four males and one female from southeastern Louisiana; one male and one female from southern Mississippi; and 13 males and five females from Florida.

All these specimens (now before me) are adult except three males in first-winter plumage from Orange County, Florida. The whole series is in excellent condition, not even the breeding birds being badly soiled or worn. The western birds—that is, those from Mississippi, Louisiana, Oklahoma, and Tamaulipas—are separable at a glance from the others by virtue of the whiteness of the supraloral area. This area is *pure* white in the Tamaulipas male (February 22), in a male from McCurtain County, Oklahoma (April 20), in a female from Lacombe, St. Tammany Parish, Louisiana (May 7), and in a female from Gulfport, Harrison County, Mississippi (March 17). In all the others the white is very faintly tinged with yellow about midway between the nostril and the top of the eye. All these "western" birds are short-billed. They belong to the race *albilora*.

The eastern birds—that is, those from Georgia and Florida—resemble each other closely insofar as color of the supraloral area is concerned. In some individuals the yellow of this area fades abruptly to white in the region of the nostril, but on the whole the series is uniform in having a yellow supraloral spot. The series is, however, readily separable into two groups on the basis of bill proportions. Most of the birds have thickish, rather heavy looking bills; but nine have long, very slender bills. All but one of these individuals are breeding birds from one locality—Walton County, Florida—and no specimen from Walton County, Florida, has a short, thick bill. As a group the Walton County birds are so uniform and so readily dis-

tinguishable from breeding birds of peninsular Florida that describing them as a race seems fully warranted. I propose that they be called

Dendroica dominica stoddardi, new subspecies

TYPE.—(Plate 1). Adult male in slightly worn breeding plumage; George M. Sutton collection No. 11008; collected near Freeport, Walton County, Florida, April 16, 1950, by Herbert L. Stoddard, Sr. The exposed culmen of this specimen measures 15 mm., the wing 64, and the tail 49.

SUBSPECIFIC CHARACTERS.—Similar in color to *Dendroica dominica dominica* (Linnaeus) of southern New Jersey, southern Maryland, Delaware, eastern Virginia, the Carolinas, Georgia, and peninsular Florida, and obviously very close to that race, but bill conspicuously slenderer. Not close to *D. d. flavescens* Todd, a long-billed race having pale yellow (rather than white) breast and belly. Wholly unlike *D. d. albilora* Ridgway in having yellow supraloral spot and long, slender bill.

RANGE.—So far as is known, the Choctawhatchee Bay area of coastal northwestern Florida.

REMARKS.—*Stoddardi* is not intermediate between the nominate race and *albilora* except in a geographical sense. Thomas D. Burleigh, in his thoroughgoing 'Bird Life of the Gulf Coast Region of Mississippi' (Occ. Papers Mus. Zool. La. State Univ., No. 20: 448, 1944) has called attention to the "wide gap . . . on the Gulf Coast between the breeding ranges of *dominica* and *albilora*." *Albilora* does not, apparently, breed farther east along the coast than Pearlington, Mississippi. How far west along the coast a yellow-browed form breeds remains to be ascertained, but from what I see before me I suspect that this western-most of yellow-browed coastal populations is *stoddardi*.

Stoddardi embodies, then, not a tendency toward the white brow and short bill of *albilora*, but a wholly independent evolution toward longness and especially toward slenderness of bill. Where the dividing line between *stoddardi* and *dominica* lies remains to be discovered. The exposed culmen of a male specimen (Max Minor Peet collection) taken by Mr. Burleigh at Pensacola, Escambia County, Florida, on April 7, 1947, measures 14 millimeters. This is below the average bill-length of 23 breeding males from Walton County, Florida, but it is also above the average, as well as above the maximum, for 12 Georgia and peninsular Florida birds (Table 1). Three breeding males from Gainesville, Alachua County, Florida, are too short-billed for *stoddardi*. Their bills measure 12, 13 and 12.5 millimeters (UMMZ nos. 58011, 58014, and 58012, respectively). Three fall males from St. George's Island, Maryland, are rather long-billed, but not nearly slender-billed

enough for *stoddardi*. Their bills measure 13, 14 and 14 millimeters (UMMZ nos. 113055, 113050 and 113052, respectively). A winter bird (December 25) in the Peet collection from Miami, Dade County, Florida, probably is one of these long- and heavy-billed Maryland birds.

Table 1 gives a concise concept of the bill-length of Walton County birds, but the slenderness of the bill in these same birds has to be seen to be believed, hence my drawing of the type (Plate 1). The slender-

TABLE 1

LENGTH IN MILLIMETERS OF EXPOSED CULMEN OF MALE YELLOW-THROATED WARBLERS

Number of specimens	*Area*	*Average*	*Range*
23 *D. d. stoddardi* (breeding)	Walton County, Florida	15.1	14.0–17.0
1 *D. d. stoddardi* (spring)	Pensacola, Escambia Co., Fla.	14.0	
1 *D. dominica* (winter)	Miami, Dade County, Fla.	15.0	
12 *D. d. dominica*	Peninsular Florida and southern Georgia	12.5	11.5–13.0
3 *D. dominica* subsp. (fall)	St. George's Island, Maryland	13.6	13.0–14.0

ness is especially perceptible from below. Had I, during the course of this study, found a single short-, thick-billed breeding bird from the Choctawhatchee Bay district I would have questioned the validity of *stoddardi*, which apparently has a very restricted range. Mr. Stoddard, who personally collected several of the specimens used in my study, informs me that he could discover no distinctive feature of the habitat of the Walton County birds.

The series of breeding *stoddardi* on which this study was based is an exceptionally fine one and I am grateful to the authorities of the Carnegie Museum for their courtesy in letting me use their specimens. The type, it should be noted, is not by any means the longest-billed bird in my own series. I made a point of choosing an individual with bill-length close to the average. I regret that I did not have a larger series of breeding birds from eastern Florida and eastern Georgia and hope that someone will make a point of measuring such a series.

University of Michigan Museum of Zoology, Ann Arbor, Michigan, September 5, 1950.

LIFE HISTORY OF THE BOAT-BILLED FLYCATCHER

BY ALEXANDER F. SKUTCH[1]

ONE of the biggest birds in a multitudinous family, the Boat-billed Flycatcher, *Megarhynchus pitangua*, ranges over an immense territory extending from México to northern Argentina. It is a bird of the tree-tops, haunting the topmost boughs of the crowded giants of the forest and wandering over all sorts of more open country where the trees are not too stunted or widely spaced. Hence, it is not infrequently seen in coffee plantations with their open shade, in pastures with scattered trees, and in the riverside fringe of arboreal vegetation among the banana plantations. It occurs even in the more arid parts of Central America, along the Pacific coast, and in semi-desert valleys of the interior where a pale-colored race has been recognized. Tolerant of a wide variety of climatic conditions, it ranges from sea level up to nearly 6000 feet in Guatemala and to at least 6200 feet in Costa Rica. At the highest elevations it is possibly migratory, to a certain extent. During the year I spent at Vara Blanca in the Costa Rican highlands, I found Boat-billed Flycatchers not uncommon at 5500 feet in July and August, after which they disappeared from the vicinity and were not seen again until the following April. Restless and active, these big flycatchers, except when nesting, seldom linger long in one place and each day wander over a wide territory, in pairs or in family groups of three to five.

The Boat-billed Flycatcher is a stout bird about nine inches in length. Its color pattern is bold and striking, in keeping with its robust appearance. Its upper plumage is olive. The black of the crown is bordered below by broad, white, superciliary stripes which nearly meet on the back of the head. A wide, black band covers each cheek. The throat is white and the rest of the under plumage is clear yellow. There is a concealed patch of yellow or rufous-tawny on the crown. The heavy bill is black, broad at the base, and strongly hooked at the tip of the upper mandible. The eyes are brown and the feet blackish. Male and female are alike in appearance. In coloration the Boat-billed Flycatcher is confusingly similar to the Chipsacheery, *Myiozetetes similis*, the Cayenne Flycatcher, *M. cayanensis*, the Lictor Flycatcher, *Pitangus lictor*, and the Kiskadee, *P. sulphuratus*. The almost identical head-markings of these birds belonging to three not very closely allied genera give the evolutionist something to

[1] This paper was prepared for publication while the writer held a fellowship of the John Simon Guggenheim Memorial Foundation.

ponder. From all of these four species which it so closely resembles in coloration, the Boat-bill is readily distinguished by its voice and the form of its nest, and from all except the Kiskadee by its far larger size. From the last, which is equally large, the Boat-bill may be distinguished by its heavier bill and the absence of cinnamon-rufous on the remiges, which on the Kiskadee is conspicuous in flight.

FOOD

Like most flycatchers, the Boat-bill subsists upon both insects and fruits. When hunting insects, it rarely makes the long, spectacular sallies into the open air above fields, rivers or tree-tops which are so characteristic of *Myiozetetes*, *Tyrannus* and others of the larger members of the family. On the contrary, while perching in the tree-tops it scrutinizes the surrounding boughs and, when it sees a suitable insect resting upon leaf or limb, makes a quick dart to pluck it off, usually without alighting beside it. In this method of hunting it resembles some of the cotingas, such as *Tityra*, *Pachyramphus* or *Platypsaris*, rather than the flycatchers which are most like it in size and appearance. Usually, its victims are of substantial size, and often they are green. During the drier early months of the year when the cicadas sizzle loudly among the trees, they contribute largely to the diet of the Boat-billed Flycatcher. The bird, snatching one of the big insects from the twig or trunk where it rests, carries it to some convenient perch against which the flycatcher proceeds to beat it noisily. After knocking it several times against the branch, the bird turns it in its bill by loosening its grip at the same time that it gives the insect a slight toss, then seizes it in a different position and beats it until it has been thoroughly pounded on all sides. Then the bird gulps down the tough, dry morsel. It would be interesting to know whether the flycatchers can distinguish the male cicadas, which are little more than hollow sound chambers, from the females which contain more nourishment, and whether they eat only the latter.

Of fruits, I have seen the Boat-billed Flycatcher eat small wild figs, berries of *Cissus* and *Miconia* (Melastomaceae), and the dry green fruits of *Cecropia*. The bird often plucks berries much as it catches insects, by flying up and pulling one from the cluster, without alighting. But if there be a satisfactory perch within easy reach of the cluster, it may rest there and gather the fruits at ease. Soft berries such as those of *Miconia* are swallowed directly; but I have watched a Boat-bill dart up to a dangling fruiting spike of a *Cecropia* tree, tear away a small portion of the crowded green fruits and beat it vigorously against a neighboring branch before swallowing it with an upward

toss of the head. The whole procedure almost exactly duplicates the bird's actions in capturing and devouring a cicada!

VOICE

The common call-note of the Boat-billed Flycatcher is a loud, rather high-pitched monosyllable, rapidly repeated while the bird perches or flies—'*choip choip choip choip.*' Heard close at hand, this note sounds slightly raucous, but two or three Boat-bills calling in this manner in the distant tree-tops create a delightful music, as of soft chimes. While resting, the Boat-bill delivers a long-drawn, whining '*churr*'.

Like many other flycatchers, the male Boat-bill is most melodious in his twilight singing. In the valley of El General in Costa Rica, I have heard him practice his dawn-song in a tentative fashion on clear, cool mornings in early January, but usually it is late February, and sometimes even March, before he performs in good earnest. Thenceforth, he may be heard singing at daybreak well into June, and at times even in July. A bird which sang at daybreak on a number of mornings in late September and early October had apparently lost his mate. To deliver his song he chooses some lofty exposed perch in a tree-top, at the edge of the forest or in a clearing. Here he repeats over and over a loud, clear, ringing note, sounding like '*cheer*,' which at irregular intervals he punctuates by a slurred note of very different character, '*bo-oy.*' Rarely the whining '*churr*' is interjected into the song, but the far-carrying, clear notes always predominate. This stirring, spirited performance is begun in the earliest gray dawn and continued for many minutes. One Boat-bill that I watched on the first of April sang with scarcely an interruption for 25 minutes, then, appearing to tire, continued haltingly for about ten minutes more. The dawn-song is rarely continued until sunrise and later in the day is delivered only exceptionally, and briefly, under the stress of great excitement.

The dawn-song may be delivered from the same tree where the female will later build her nest, or some distance away from the nest-site. In 1939, a Boat-billed Flycatcher sang sometimes in January, and more consistently and at greater length from late February onward, in the top of a tall wild fig tree growing above a rivulet between pastures, or in neighboring trees. Late in March, his mate began her nest in this same fig tree. When this nest fell, she built another in a much lower tree growing in the pasture at least 100 yards away. The male continued to sing at dawn in the fig tree but later in the day came to guard the new nest. This second nest was also

prematurely lost. If the female built another it was so far distant that I did not succeed in finding it; but the male continued to sing at daybreak in the tall fig tree. He was last heard here in June.

At the end of February, 1940, a male sang at dawn in the top of a tall ojoche tree standing isolated in a pasture. On some mornings he began in another tree at a distance but would fly to the ojoche tree to deliver his closing notes. On several mornings in early March, the female joined him in the ojoche tree as he was concluding his refrain. On two mornings, her arrival coincided with, and seemed to be the cause of, the cessation of his song, and on one of these mornings, of his departure as well. On other mornings he lingered for several minutes with her in the ojoche tree. The female, if she found birds of other kinds resting in the ojoche tree when she arrived, especially any of the larger flycatchers, would proceed to drive them away by flying at them and loudly snapping her bill. Late in March, she built and began to incubate in this tree. In early April, while incubation continued, the male delivered his dawn-song in a Spanish plum about 200 feet from the nest-tree but would fly to the latter upon its conclusion. The nestlings hatched about April 13, and then I ceased to hear the dawn-song. On April 27 the young flycatchers vanished, probably into the gullets of toucans. That afternoon, for the first time in many days, I heard the male Boat-bill utter the loud, clear notes of his dawn-song, repeating them many times in a tree not far from the nest-site. Next morning he sang at dawn for the first time since the eggs hatched. During the following days he performed at dawn in a tall, slender tree standing on the ridge above the nest-tree. On May 2, the female began a new nest in another ojoche tree, about 500 yards from her first nest-tree. Now the male chose a new singing-tree about midway between the sites of the first and second nests. By mid-May, when incubation was in progress in the new nest, I no longer heard him sing at dawn.

In a neighboring pasture another pair of Boat-billed Flycatchers had a nest only 20 feet above the ground, in the densely leafy crown of an *Inga* tree which offered no high, exposed singing perch. One morning in late March, while the female incubated, I found the male singing at daybreak in the top of a nearly leafless tree on the opposite side of a small river, about 200 feet from the nest. After a while he moved to a tree about halfway between his first position and the nest and continued to sing for a few minutes longer, until the daylight grew too strong for dawn-singing.

In March, 1943, a Boat-billed Flycatcher built a nest in the top of a guava tree close beside my house. Her mate either sang little or

irregularly or did most of his dawn-singing at a long distance from the nest. That the latter might be the true explanation is suggested by the fact that one morning I heard him sing in the distance before he came to continue his monologue in the yard. When he sang near the house, it was usually in a tree-top 20 or 30 yards from the nest-tree; only once did I hear him perform briefly at dawn in the nest-tree. On many mornings while his mate built and incubated close by my residence, I failed to hear his song. Yet he was always watchful of the nest during the day.

I believe that we may fairly conclude from these observations that the male Boat-bill's singing-tree is often chosen by his mate for her nest, especially if it offers a good site. If the female does not build in the singing-tree, or loses a nest there and places the second somewhere else, the male may or may not change his singing post to be nearer the nest, but is likely to do so if the nest is situated more than 100 yards from the original singing-tree. If he begins his dawn-song at a good distance from the nest-tree, he may move to some intermediate station to deliver his concluding notes.

NEST BUILDING

In 1942, I found two Boat-billed Flycatchers beginning their nests on February 23, in the basin of El General. March, however, is here the month of most active nest-building. In Guatemala, I found a pair feeding nestlings on April 30, in a nest that must have been begun no later than the first of the month. In southwestern Tamaulipas, México, Sutton and Pettingill (1942: 21) saw no birds building until April 7.

The 24 nests, finished and unfinished, that I have seen, were in trees standing isolated in clearings and ranged in height from 20 to about 100 feet above the ground. Cherrie (1916: 241) however, recorded a nest of this species in the Orinoco region that was only ten feet above the ground. Usually the open cup is built far out on a leafy branch. The lowest nests were all among the foliage in the very tops of small trees, where they were supported by branches so long and slender that it was impossible to climb to them, although in some instances I could see their contents reflected in a mirror attached to the end of a long pole and raised above the nest. A few of the higher nests were in the crotches of stout branches, sometimes against the main trunk. Three nests found in 1942, and all apparently the work of the same bird, were placed at heights ranging from 70 to 100 feet in stout crotches in charred and nearly branchless dead trees standing in a recently made clearing. Here they were without shade or conceal-

ment and conspicuous from afar. However, this was a most unusual situation; most nests are in living trees, and usually they are well out from the trunk. One nest was well concealed in the midst of a densely leafy mistletoe that grew as a parasite high on a leafless tree standing in the midst of a pasture.

I have watched carefully the construction of two nests, more or less casually the building of half a dozen more, and have seen only the female at work. Usually her material is brought from a good distance, often from points out of sight. So far as I have seen, it is all gathered from well up in the trees, never from the ground. I have examined several nests and found nothing in them of undoubted terrestrial origin. The twigs that she uses for the foundation are broken from dead branches in the tree-tops, often with considerable labor, and the long, fibrous roots that she employs in the lining are from orchids, ferns and other plants that in tropical forests grow high above the ground. Some of the sticks intended for the nest's foundation are branched and so long and stiff that the flycatcher must struggle hard to push and pull them through the surrounding branches to the nest-site. At times they are knocked from her bill by some obstruction and fall to the ground, where they are a total loss; she never descends to recover them but prefers to gather fresh material from a neighboring tree-top. Later, when she lines the nest, she flies up with the long rootlets of air-plants trailing far behind her and carefully coils them into the bottom of the cup.

While the female Boat-billed Flycatcher builds, her mate perches close by the nest in indolence or languidly preens his feathers. At times he bestirs himself to follow her on excursions to gather material. Returning, he may bear a twig or a rootlet in his bill, but he never adds this material to the nest. He may drop it while he perches close by watching his mate as she strenuously arranges her own contribution—a lengthy process. Or he may continue to hold it until, the task of shaping the nest completed, she flies off for more material, when again he follows, still bearing the twig in his bill. One male brought the same root thrice to the fig tree where his mate built and thrice carried it away. Once, perching near the nest, he held a rootlet for 11 minutes by my watch, then dropped it to chase away a trespassing bird. It never seemed to occur to him to pass it to his mate and save her much hard work, nor to her to take it from him. I have seen this same behavior at a number of nests. Male Band-tailed Tityras, *Tityra semifasciata*, and Inquisitive Tityras, *T. inquisitor*, carry material back and forth in much the same fashion while their mates build, but they rarely if ever take it into the nest-cavity.

The female Boat-bill who built her nest high up in the fig tree worked at it for at least ten days, but she did not labor with the concentrated activity of many building birds. During four hours of the early morning she brought material only 41 times, or about ten times per hour. Four days after I last saw her bring a rootlet to her nest, I found the completed structure on the ground. Probably it had been torn from the tree by toucans. A week later this female began a new nest in a peine de mico tree, *Apeiba Tibourbou*, close behind the cabin I then occupied. After she had worked a day or two, this incipient structure was abandoned when a five-foot iguana climbed into the tree-top and passed the night close beside it, taking no account of the birds' attempts to drive it back to earth. The flycatcher then returned to the fig tree that had held her first nest and laid the foundations of a third structure on the side of the tree opposite the site of the first and about 100 feet up. This was also, for some undetermined cause, abandoned before it contained nestlings; then the Boat-bill resumed work on the nest she had begun three weeks earlier in the monkey's-comb tree behind the cabin. Five or six days later this nest appeared to be finished, after the female bird had devoted a total of six or eight days to its construction.

The Boat-billed Flycatcher which on March 10, 1943, began a nest in the top of a guava tree growing just outside my dining-room window, worked in a more leisurely fashion. Although the bird I had watched as she built in a fig tree four years earlier had labored steadily if not rapidly in the cool of the morning, this Boat-bill worked principally later in the day. I rarely saw her visit the nest while I sat at early breakfast and, if I continued to watch after breakfast, there was so little activity that I finally abandoned the uninteresting vigil. But while I ate lunch, between eleven o'clock and noon, she brought material more frequently; on some days she continued to do so until about the middle of the afternoon. Even then, visits were widely spaced; when the nest was nearing completion, the female brought material only thrice in the hour between 12:20 and 1:20 p. m. This Boat-billed Flycatcher devoted about two weeks to the construction of her nest. I last saw her bring material on March 22, and she did not lay the first egg until March 31. Sutton and Pettingill (1942: 21) remarked upon the deliberate way in which Boat-billed Flycatchers proceeded with nidification in the state of Tamaulipas, México.

Like flycatchers of a number of other species, the pair of Boat-bills that built in the guava tree close beside my house sometimes uttered a peculiar nest-song. This was a rapid series of low, intimate notes suggestive of contentment. I first heard it early one afternoon soon

after the nest was begun. While the female Boat-bill perched close beside the nest, holding a stick she had brought for it, the male sat in the nest and delivered many low, mincing notes, very different from his more usual utterances. At the same time, Chipsacherry Flycatchers and Gray-capped Flycatchers, *Myiozetetes granadensis*, were singing rather similar nest-songs as they examined with their mates possible nest-sites in neighboring orange trees; probably this stimulated the Boat-bill to sing, too. I have more than once noticed that the nest-song of one pair of flycatchers evokes the corresponding utterances of neighboring pairs, perhaps of distinct but related species. During the remainder of the period of nest-building, I heard this low, "confidential" song a few times more from both male and female but, after incubation began, I failed to hear it again until the day the eggs hatched. At the other nests I watched during the period of constructino, I never heard the nest-song, possibly because these nests were so high above me, possibly also because I spent less time with them.

The completed nest of the Boat-billed Flycatcher is a broad and relatively shallow open cup. A typical structure measured 4.0 inches in internal diameter by 1.75 inches in depth. The foundation, bulky but loose, consisted of coarse, stiff material; that of one nest was composed of about equal parts of crooked, dry twiglets and slender, leafless stems of epiphytic orchids—one of the latter was 14 inches long. Another nest contained lengths of dry vines in the foundation. In yet another, the foundation and outer layers were composed almost wholly of small epiphytic orchid plants with green leafy shoots, chiefly of a species of *Dichaea*. The inner layer consisted of: slender, flexible rhizomes of creeping epiphytic ferns; fibrous roots of orchids, ferns and other epiphytes, some very long, many partially decayed, but a few still green; dry tendrils; and a few short twiglets. One nest contained living fragments of small epiphytic orchid plants, one of them eight inches long, with small green leaves and roots attached. The fabric of the nest is sometimes so open that light passes through the bottom. It often costs the bird much strenuous effort to break twigs from dead branches and pull away roots and rhizomes from moss-covered bark where they grow firmly attached. Doubtless it is for this reason that, at best, the flycatcher brings material to the nest relatively few times in the course of an hour. Only a big, powerful bird could build a nest of these ingredients.

The nest of the Boat-billed Flycatcher was long ago correctly described by Euler (1867: 225) as a slight, frail, open structure; a number of subsequent writers have confused it with the bulky roofed nest of the Kiskadee which this bird resembles so closely in size and

coloration, although it is so different in voice, habits and temperament. Once in Guatemala, I found both Boat-bill and Kiskadee nesting in the same tree, in apparent amity. The Kiskadee's domed nest was in a main crotch, and the Boat-bill's much slighter structure was on a slender branch far above.

THE EGGS

I have four records of nests which contained three eggs or nestlings, three records of nests which held two eggs, and two of nests with two nestlings. At the nest in the peine de mico tree where a set of three eggs was laid, an interval of two days separated the laying of the second and third eggs. The Boat-billed Flycatcher that built in such a leisurely fashion in the guava tree beside my house laid, so far as seen, only two eggs, the second three days after the first. Because of the inaccessibility of the nests I have no measurements of the eggs, but I have seen five sets of eggs with mirrors and have held in my hand part of an empty shell. The eggs are whitish, thickly speckled and blotched with brown and pale lilac over the entire surface, but most densely on the large end. Belcher and Smooker (1937: 233) gave measurements of a set of three eggs of the nominate race of the species, collected by them in Trinidad. These eggs measured 30 by 21.5, 29.5 by 21.5 and 29.5 by 21.5 millimeters; their markings resembled those already given for the Central American race.

INCUBATION

The bird in the guava tree began to incubate the day before her second and last egg was laid, but the flycatcher in the peine de mico tree was not seen incubating until the day on which she completed her set by laying the third egg. During the interval between the beginning and completion of laying, however, one member of the pair was almost always to be found watching the nest from a neighboring leafless tree.

Incubation is carried on by the female alone, but at every nest, six in all, that I have watched during this period, the male has stood guard over the eggs during her absences.

During six hours of the morning at one nest, the female Boat-billed Flycatcher took five sessions on the eggs, ranging in length from 27 to 68 minutes and averaging 44.6 minutes. Her six recesses varied from five to 20 minutes in length and averaged 13.3 minutes. She incubated 77 per cent of the time. With two exceptions, she each time remained patiently warming the eggs until the male arrived to guard them. He always flew silently into the ceiba tree, and the moment he arrived

the female as silently departed. During her absence, the male continued to keep watch over the nest, sometimes perching close beside it, sometimes at a distance of several yards, resting near the ends of the branches, more rarely standing upon the rim of the nest itself. While on sentinel duty, he frequently busied himself preening his feathers. His exercise of guardianship, during the morning I watched, was limited to driving from the vicinity of the nest, with an aggressive forward dart and loud warning clacks of his heavy bill, such innocent and unwitting intruders as a wintering Yellow Warbler, *Dendroica aestiva*, and a Chipsacheery Flycatcher. However, he merely served notice that they trespassed and did them no harm. Upon his mate's return from her usually brief recess, he greeted her with loud, ringing cries which sounded like '*choip choip*' or '*choee choee*,' then promptly flew away. She at once settled on the nest, often uttering low, soft notes suggestive of contentment. The male Boat-bill's noisy departure contrasted sharply with his silent arrival.

Only twice during the morning did the female Boat-bill leave her eggs before her mate's arrival to guard them. This first occurred when she heard or saw him rush to attack a party of Swainson's Toucans, *Ramphastos swainsonii*, that had appeared on the hilltop west of the nest and about 500 feet distant from it. As soon as the toucans flew within view, she dashed away to aid her mate in harrying these hated and formidable enemies. After the great-bills had vanished into the neighboring forest, the male Boat-bill promptly came to stand guard over the vacant nest until his mate, who doubtless had taken advantage of her excursion to snatch a few morsels of food, returned two minutes later. The whole episode demonstrated the closest coöperation between the pair in guarding and defending the nest.

Toward the end of the morning, after she had been sitting for an hour without relief, the female hopped from the nest to perch close beside it, facing it, while she preened her feathers. After eight minutes of this, her mate still delaying his arrival, she returned to her eggs. After sitting only two minutes more, hunger overcame her attachment to her nest and she winged away, leaving it unguarded. Five minutes after her departure, the male flew up to the unattended nest and stood sentinel over it until, after two minutes more, the female returned to resume incubation. Because at this nest the male was to be seen in the vicinity only during his mate's absences, their alternation in attendance was admirably coördinated.

The following year I watched another nest situated only 20 feet above the ground in the top of an *Inga* tree growing in a pasture close by a small river. Here the female was incubating three eggs. During

4.5 hours of the morning, her sessions and recesses were as follows (recesses in italics):

7 54 *8* 91 *9* 62 *15* minutes

Thus, she kept her eggs covered 87.6 per cent of the time—far more than any other flycatcher that I have ever watched incubate; in fact, more than any other arboreal bird that I personally have watched, except jays and goldfinches which are fed liberally by their mates while they incubate.

During four of the female's five recesses, the male stood sentinel in the top of the nest-tree. When she began her recess at 10:30 a. m. he had already been resting half an hour in the top of this tree, much of the time preening his feathers. Now, when she flew off for food, he followed. There was a flurry of excitement among the tops of the trees by the river, which from my watch-post I could not see. Apparently, the male Boat-bill had left the nest-tree to help drive away some enemy. As soon as the excitement died away, he came to perch in a riverside tree whence he could overlook the nest. Thus he watched over the nest during each of the female's absences; but because of his habit of resting for long periods in the nest-tree, even while his mate was there covering the eggs, this pair did not present the fine picture of soldier-like change of guard which was so striking at the nest in the ceiba tree, where both members of the pair were rarely present at the same time. Once, however, this male came to the nest-tree to keep guard when from a distant lookout he saw the female leave the eggs, and twice he flew from the nest-tree as he saw her approach. Among trespassers driven from the vicinity of the nest that morning were a female Inquisitive Tityra, a Chipsacheery Flycatcher, a third Boat-billed Flycatcher, and a Gray's Thrush, *Turdus grayi*. When pursued by the male Boat-bill, the thrush dodged about among the boughs of the nest-tree, refusing to leave until the female jumped from her eggs and joined her mate in chasing the brown intruder who then flew to a neighboring tree.

On April 8, 1949, Mr. and Mrs. Darwin Norby helped me make what we hoped would be an all-day record of incubation at an inaccessible nest, situated about 30 feet up on an exposed limb of a *Cecropia* tree, in the pasture behind my house. After the vigil had continued more than ten hours it was abruptly terminated, at 4:15 p. m., by a drenching thunder storm. During this period we timed 16 sessions on the eggs which ranged from 15 to 77 minutes and averaged 30.2 minutes. An equal number of recesses varied from two to 19 minutes and averaged 8.3 minutes. The female Boat-bill covered her eggs for

78.4 per cent of the 10.25 hours' observation time. The male, although he often rested in the nest-tree while his mate sat in the nest, did not guard during her absences as consistently as at some other nests I have watched. However, he stayed by the nest 83 per cent of the time while his mate was at recess, but lingered in the nest-tree only 34 per cent of the time she spent in incubation.

At the nest in the guava tree beside my house, the male, during the female's absences, guarded from a neighboring tree-top rather than in the nest-tree. I had great hope of learning the length of the incubation period at this nest, whose contents I could see by raising a mirror attached to the end of a long pole. The first egg had been laid in this nest on March 31, incubation had begun on April 2, and the second egg had been laid on April 3. By the afternoon of April 20, neither egg had hatched. At noon on the following day the pair were attending the nest. Shortly after mid-day a violent rainstorm blew up and continued for about an hour, forcing me to delay my visit of inspection with ladder, long pole and mirror. When at last I could raise the mirror above the nest and look in, it was empty! A Swainson's Toucan had passed by the house just as the storm was ending, and this for me was sufficient explanation of what had occurred. On the ground beneath the nest I found the cap of one of the shells, neatly severed from the body of the shell by the bill of the birdling within, not roughly broken off as by a predatory creature. Hence I had no doubt that one of the eggs had hatched after no less than 18 days of incubation. Possibly this was the first egg that had been incubated for a day before the set was complete, and thus the true incubation period was 19 days. All of my other low nests were found after the eggs were laid, or destroyed before they hatched, and I have only this one approximation of the incubation period.

THE NESTLINGS

I have seen newly hatched Boat-billed Flycatchers only as images reflected from a mirror. Examined in this manner, they have the aspect of typical passerine nestlings, and the bright yellow interior of the mouth characteristic of the flycatcher family. They are fed largely, if not wholly, with insects by both parents. Especially during their first week they are almost constantly guarded, as I saw long ago at a nest in Guatemala and have since verified at a number of Costa Rican nests. After feeding, the female broods, remaining until the male arrives with food, then she flies off. After delivering his morsel the male lingers upon the rim of the nest or close beside it, guarding, until she returns to feed and brood once more. The male

during his periods of sentinel duty never, so far as I have seen, actually covers the nestlings but merely watches over them. At times, while the nestlings are still very small, this routine may be varied, the female simply moving from the nest to a point beside it when her mate arrives with food, settling down to resume brooding after he has fed the nestlings, and leaving him free to fly off and hunt more food.

At a nest far beyond reach in a parasitic mistletoe bush high up in a *Xanthoxylon* tree, the nestlings, which from indirect evidence I calculated to be five days of age but whose number I could not determine, were fed only seven times during the course of three hours—four times by the male and three by the female. The female brooded for four periods ranging from 34 to 45 minutes, totalling 154 minutes. In addition to this, she stood guard on the nest's rim for one period of five minutes, after interrupting her brooding to drive away an intruding Yellow-bellied Elaenia, *Elaenia flavogaster*. The male Boat-bill performed sentry duty for three periods of nine, three and eight minutes, respectively; these corresponded with his mate's brief absences for food and were all she took during the course of three hours. Except for one interval of two minutes, the nest was constantly attended while I watched.

Eight days later, on June 18, this nest in the mistletoe held a single, well feathered nestling which was easily visible from the ground as it rose to take food or stood up in the nest preening its feathers. During three hours and 20 minutes the young Boat-bill was fed a total of 16 times, or at the rate of 4.8 times per hour. Since the female did not now brood after each feeding, it was not always possible to distinguish the sexes of the parents; the male fed the nestling at least six times, the female at least five times. The latter brooded for a total of 75 minutes. During 75 additional minutes, one or the other of the parents, but chiefly the father, rested in the nest-tree or close beside it, keeping guard over the nestling. In all, the young bird was watched over, one way or another, for a total of 150 minutes during the 200 minutes of my watch, or three quarters of the time. That the male rested in the nest-tree for the particular purpose of guarding the nestling, and not merely because this was a place as good as another for loafing, was amply demonstrated by his prompt departure each time his mate arrived to take charge.

After six more days this young Boat-bill, which had long been completely feathered, was still in its nest in the mistletoe bush. On the morning of June 24, I again watched it for two hours 20 minutes. It was fed only nine times or at the rate of 3.9 times per hour, by both parents. Its food, so far as I could recognize its nature, consisted

wholly of insects, some of them very large, including a cicada that it swallowed with difficulty. The young bird was guarded, from points near the nest, for a total of 71 minutes by both parents and was brooded a total of 45 minutes, presumably by the mother only. Thus it was under parental vigilance, one way or the other, for 116 of 140 minutes, or six-sevenths of the time. Few nestlings of this age and degree of development are so constantly under their parents' watchful eyes. It was surprising, too, to see it brooded, for it was completely feathered, resembled its parents in coloration, and was almost ready to fly from the nest. Indeed, it seemed not to relish being sat upon; at times the youngster's restlessness caused the mother to leave the nest, but she would continue to guard close beside it.

I believe that the mother brooded the nestling, not because it required this protection, but because, when she remained to guard it, habit caused her to sit in the nest rather than stand on a branch near by, as the male did. She would alternately brood the nestling and perch near to guard it, all on the same visit to the nest-tree. If the nestling had not been guarded it would not have been brooded; guarding, not brooding, seemed to be the real purpose of the mother's as well as the father's continued presence at the nest.

This young Boat-billed Flycatcher left the nest on June 28. I first saw the parents bring food to the nest on June 5, which would make the youngster about 23 days old at the time of its departure. The following year, three nestlings, reared in a nest into which I could look with a mirror, departed spontaneously when 24 days old. At this age they could fly well, one of them covering a distance of more than 100 feet on a rising course. Because young Boat-bills often grow up in nests situated at great heights, it is important that they have good control over their wings before they venture into the open. On the morning when these three youngsters left home, their parents were watchful, loudly protesting my approach to their offspring. The fledglings did not differ essentially from the adults in coloration.

After their three fledglings left the nest in the *Cecropia* tree in the pasture behind my house, the parents were so vigilant and excitable that I could not come within 100 yards without stirring up a storm of protest. Even when I suddenly emerged from the forest on the south side of the pasture, an anxious Boat-bill would notice me almost immediately and fly up to scold. Then one or both of the parents would follow me about the pasture, often darting angrily above my head, and resting on low boughs of the guava trees "to complain." All this while the youngsters would remain out of sight.

THE SECOND BROOD

In El General, where the Boat-billed Flycatchers begin their nesting operations in late February or more commonly in March, I once found a pair feeding nestlings as late as July 17. This may possibly have been a second brood, but more often, I believe, these late nests represent repeated attempts to rear a single brood. Thus, in 1942, the pair that nested in the trees about my house began building on February 23, but because of repeated disasters they did not have fledglings until June 5. Even then they probably would not have succeeded in rearing young but for my intervention; before the nestlings could fly, the fork of the tree that bore them broke and crashed to the ground in a storm of wind and rain, and I placed the young birds on a neighboring bough for safety.

That same year, however, I found evidence of a second brood. At the end of April, two fledglings were successfully reared in a nest built high up in the crotch of a barkless, dead tree standing in a clearing. In the middle of June, there was a nest 100 feet above the ground in the top of another gaunt, dead tree about 200 feet from the first. Because of the propinquity of these two nests, both of which were in sites of the same character but very different from those selected by the great majority of Boat-billed Flycatchers, I have little doubt that they were the work of the same bird. It was impossible to look into this lofty nest, but in its utterly exposed position it could be seen from a long way off, and by watching I tried to learn what was happening there. On June 17 the female appeared to be incubating but, by June 23, I concluded that the nest had been abandoned. Then on July 7, the flycatcher was bringing material to this same nest and shaping it. From July 14 to 22, I often saw the female sitting in the nest in the mornings, as though incubating—but strangely enough she was usually absent during the afternoons. By the beginning of August the nest was deserted. Apparently this Boat-billed Flycatcher which attempted to rear a second brood was either physiologically or psychologically unable to do so, perhaps in some condition intermediate between the breeding and the non-breeding state. It would have been interesting to know whether she actually laid eggs or sat sporadically in an empty nest.

THE PERSISTENCE OF FAMILY GROUPS

After their departure from the nest, the young Boat-billed Flycatchers remain with their parents for months, continuing in their company long after they cease to be dependent upon them for food. The flocks of three, four or five individuals that roam about through

most of the non-breeding season apparently consist of parents with their full grown young. In 1942, three young were fledged in a tree behind my house. During the latter half of that year, and through January and February of the following year, five Boat-billed Flycatchers used to pass through the yard morning and evening—in the morning before sunrise flying down to the river and the cane-fields in front of the house, and late in the afternoon returning toward the coffee grove in the rear. They would straggle one behind another rather than fly in a compact flock and while perching in the shade trees about the house would utter their long, drawled *'churr.'* This was doubtless the pair that had nested close by, with its three offspring. Toward the end of January, I thought that I detected signs of "discord" in this family, but the five held together more than a month longer. On the first day of March, I heard the male Boat-bill sing his dawn song for the first time that year, and after this I no longer saw more than two individuals in the yard. On March 10, 1943, as already recorded, the female began to build in the guava tree close beside the house. This year, the pair did not succeed in rearing a brood near the house and apparently were equally unsuccessful when later in the season they retired to a distance. During the closing months of the year, I saw only two birds in the yard, in place of the five that had frequented it the preceding year. If the pair does not produce offspring, the birds seem to remain by themselves until the following year.

During October and November, 1948, a pair of Boat-billed Flycatchers, which apparently had reared no progeny during the preceding nesting-season, roosted nightly in a small tree of *Inga spectabilis* in the pasture behind my house. Here they slept about 20 feet above the ground and always separated from each other by a yard or two—never in close contact, as mated Black-crowned Tody Flycatchers, *Todirostrum cinereum*, sleep. Although they might have concealed themselves well amidst the coarse compound leaves of the tree, they perched on the leafless basal portions of stout twigs where with an electric torch I could readily see them from below. However, the foliage formed a thick canopy above them these rainy nights. When I threw the beam of light upon them, their heads were always exposed rather than turned back among their feathers; yet they remained motionless while I looked up at them.

ENEMIES

The chief enemy of the Boat-billed Flycatcher is the toucan. I have seen few antipathies in the feathered world so strong as that of the Boat-bill to Swainson's Toucan, and to a lesser degree to Frantzius's

Araçari, *Pteroglossus frantzii*. These are the only toucans at lower elevations in the Térraba Valley where, chiefly, I have studied the Boat-billed Flycatcher. In other parts of the flycatcher's vast range, it doubtless has to contend with other species of these great-billed nest-robbers. Toucans, more than any other predators, seem to be the reason for the almost constant guard which Boat-billed Flycatchers keep over their eggs and nestlings. The Boat-billed Flycatchers do not wait for the toucans to approach their nests but as a rule go forth to meet them while they are still a long way off and then continue to harry them until they return to the shelter of the forest. So long as the toucans remain perching, the flycatchers, fearing the long, mobile bills, do not attack them, but when the great-beaked bird is on the wing it can not defend its back, and this is the flycatcher's opportunity. Often the bold bird pounces upon the back of the flying toucan. It is careful to separate from the big toucan before he regains a perch where he could turn his bill backward with disastrous consequences to the far smaller flycatcher. Exceptionally, the sight of a distant flock of toucans will cause Boat-billed Flycatchers to hurry to their nest, if they have been watching it from some elevated position, rather than to go forth and meet their enemies.

I have never actually caught a toucan taking the eggs or nestlings of a Boat-billed Flycatcher, but I have seen both Swainson's Toucan and Frantzius's Araçari pillage the nests of enough birds of other species to be convinced that they are insatiable nest-robbers. Once I watched a Swainson's Toucan peer into an unfinished nest of a pair of Boat-billed Flycatchers, while both male and female darted angrily at the intruder, calling excitedly. However, they did not touch him so long as he remained perching beside the nest, snapping menacingly whenever they came near. On several occasions when eggs or nestlings have vanished from nests of the Boat-billed Flycatcher, I have seen toucans pass through the trees where they were situated, or it was reported to me later that they had come by.

The Swallow-tailed Kite, *Elanoïdes forficatus*, probably at times eats the nestlings of the Boat-billed Flycatcher, as I have seen it pluck the young from nests of other species in similar situations. Other hawks do not appear to give these flycatchers much trouble, especially in El General where the only other species somewhat common in the clearings during the breeding-season is the Large-billed Hawk, *Buteo magnirostris*, a mild-tempered species that subsists largely upon reptiles. One rainy afternoon late in November while I watched three Boat-billed Flycatchers, along with a few Chipsacheeries and other birds catching insects among the trees in my yard, a hawk suddenly

swooped down and seized one of the flycatchers. The hawk, which I had not seen well enough for identification, dropped with its victim to the ground on the other side of the hedge, and the other Boat-bills, now far from fleeing like the smaller birds, darted down upon the hawk, snapping their bills. I rushed out into the yard for a closer view of the proceedings, but before I could reach the gate in the hedge the hawk had vanished with its victim. Possibly a Chipsacheery rather than a Boat-bill, as I had at first supposed, was the unfortunate one, for later there were still three Boat-bills in the yard. The energy of the Boat-bills' attack on the hawk was the more remarkable, if the victim belonged to another species.

PLAY

One morning in August, I saw a Boat-billed Flycatcher fly into a tree in front of my house with a big brown feather in its bill. It beat the feather against the branch where it perched, exactly as though it were an insect. After a while it let the plume drop. As it floated slowly downward, the mate of the first bird darted out and caught it. Then, the second Boat-billed Flycatcher perched in the tree and beat the feather against the branch. Soon it let the feather drop, only to shoot out and catch it as it wafted downward, and then knock it against the branch once more. It then carried the feather to a neighboring tree and continued to beat it, but none of this knocking was very hard, as though it were not done in earnest. Finally, the bird that had the feather let it fall, and the pair flew away together.

SUMMARY

1. The Boat-billed Flycatcher wanders over the roof of the forest and through open country with scattered trees. In Central America it ranges from sea level up to 6000 feet or a little more.

2. Its food consists of both insects and small fruits. During the dry season when cicadas are abundant they form an important part of the Boat-bill's diet. Insects are snatched from leaf and bough, at the end of a rapid dart, more often than from the air. Berries are often plucked in the same manner.

3. Males deliver at daybreak a special dawn-song composed of loud, ringing notes, which later in the day they utter only under stress of great excitement. Sometimes the female builds in the tree which the male has chosen for singing.

4. In Costa Rica, nest-building sometimes begins in late February but more often not until March. Usually an isolated tree is chosen for the nest. Twenty-four nests ranged from 20 to about 100 feet in height.

5. The female builds without help from the male who often accompanies her on her flights for material and at times bears in his bill some twig or other bit of vegetation which he fails to add to the nest. The material used by the female is gathered from trees rather than from the ground and consists of coarse twigs and dry vines for the foundation, and tendrils and fibrous roots or rhizomes of epiphytes for the lining. Whole, small orchid plants are sometimes incorporated in the nest. This is a shallow open bowl and contrasts strongly with the domed nest of the Kiskadee, which has repeatedly been confused with it in published accounts.

6. Two or three eggs are laid at intervals of two or more days.

7. The female alone incubates, taking sessions which often exceed an hour in length and alternate with usually short recesses. One female incubated 77 per cent of a 6-hour observation period, another 87.6 per cent of a 4.5-hour period. During the female's brief absences for food, the male usually guards the nest, sometimes from a perch close beside it, sometimes while resting in a neighboring tree which affords a good view of the surroundings. At one nest the incubation period was at least 18 days.

8. Both parents feed the nestlings, chiefly with insects. The female alone broods, but during her absences the male stands watch over the nest so that, especially while still unfeathered, the nestlings are guarded most of the time. Even well feathered nestlings almost ready to fly are attended much of the time, the mother sometimes brooding, perhaps not because this is necessary, but rather as a variation in her mode of guarding.

9. The nestlings linger in the nest until they are 24 days old and can fly well.

10. Nesting continues until July, but most late nests appear to belong to birds whose earlier attempts to rear progeny were unsuccessful. Sometimes a pair which has successfully fledged an earlier brood will nest again, but there is no evidence that second nestings yield offspring.

11. Young birds hatched in May or June may continue to fly about with their parents until the following February, thus giving rise to flocks of four or five. Pairs without offspring remain together during the long non-breeding season, the two roosting a few feet apart in the same tree.

12. Boat-billed Flycatchers display a tremendous antipathy to toucans which are apparently the chief despoilers of their nests. When these huge-billed birds appear in the vicinity, the flycatchers go a long way to meet and harry them.

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THE SIGNIFICANCE OF THE NUMBER OF TOES IN SOME WOODPECKERS AND KINGFISHERS

BY J. DELACOUR

THE presence, reduction, or absence of one toe is of no very great importance as to the relationship of birds otherwise quite closely allied. It apparently does not indicate more than specific distinction in many cases. This has already been stated by E. Mayr and by me as regards: 1) the Black-bellied Plover (*squatarola*) which we united with the Golden Plovers in the genus *Pluvialis;* and 2) the Sanderling (*alba*) which we considered a species of *Calidris*, notwithstanding the presence of a very small, non-functional hallux in some species, and its absence in all the others. It certainly seems unreasonable to base genera entirely on such an obviously recent and unimportant character as a vanishing organ (Zoologica, 30: 106, 1945). Similar presence or absence of the hallux is also noticed among tropical plovers.

The same consideration applies to woodpeckers. Peters has recognized it in uniting in the genus *Dinopium* the species *benghalense*, which possesses a reduced hallux, with *shorii*, *javanense*, and *rafflesi*, which have only three toes, making *Brachypternus* a generic synonym (Birds of the World, 6: 143–146, 1948). If such an action is accepted, however, it seems logical to carry it further. The Aethiopian Bamboo Piculet (*africana*), a very peculiar bird, differs only slightly in color and not at all in structure, pattern of plumage, and habits from the Asiatic and Malaysian *ochracea* and *abnormis*. Although *africana* has four toes and the others three, I propose to place them all in the genus *Sasia* Hodgson 1836, and to consider *Verreauxia* Hartlaub 1856 a synonym.

The Pied Woodpeckers stand in a similar position. As it has been so far accepted, the two northern species in which the hallux is lacking (*tridactylus* and *arcticus*) have been assigned to the genus *Picoïdes*,

while those with four toes make up the genus *Dendrocopos*. There is however no other important difference in the color pattern, the structural features, or the life habits of all these very similar birds.

The excellent work by W. H. Burt, 'Adaptative Modifications in the Woodpeckers,' has not revealed any striking anatomical or biological distinction between the species of Pied Woodpeckers that he studied (*Picoïdes arcticus*, "*Dryobates*" *villosus* and "*D.*" *pubescens*). They vary within narrow limits. *Picoïdes* represents an extreme adaptation to arboreal habits. The food habits of the two three-toed species, according to Beal (1911), are completely similar; they subsist almost entirely (85%) on insects obtained by pecking wood, either dead or alive. "*Dryobates*" *villosus*, however, gathers only 45% of its food by pecking wood, 30% on the surface of trunks and 25% from other places. It would be interesting to find out exactly how the numerous Asiatic species feed. It does not appear that generic distinction between three-toed and four-toed Pied Woodpeckers can be upheld from Burt's data.

K. H. Voous has not studied the relationship of the two groups in his 'History and Distribution of the genus *Dendrocopos*' (Wageningen, 1947) and has left out *Picoïdes*.

The head of the males of *tridactylus* and *arcticus* is marked with golden yellow while red is shown in the other species, but two of them, *marhattensis* and *auriceps*, also have a yellow crown. The hallux is variously developed; it is small in *cathpharius*, *hyperythrus*, *macei*, *atratus*, *minor*, and *pubescens*. I therefore believe that all species of Pied Woodpeckers should be placed in the genus *Picoïdes* Lacépède 1799, and I consider *Dendrocopos* Koch 1816 a synonym.

I am well aware that such an action will be a shock to some ornithologists because it affects several well known European and North American species. But the present generic name *Dendrocopos* has only recently been in use, having replaced *Dryobates* on a nomenclatorial technicality. It seems preferable to make a new change with the shortest possible delay, as there is little doubt that it will soon be proposed and accepted by many workers. Mr. H. E. Wolters has recently written from Germany suggesting its necessity.

We are facing a related if slightly different problem with the small kingfishers, all fairly closely related, that constitute the subfamily Alcedininae. Some have four toes and others three, but here the medial front toe, not the hallux, is reduced or absent; at best it is but a non-functional relict. There are numerous species inhabiting the Old World—Europe, Asia, Australasia, and Africa—and they have so far been generically sorted out according to the number of their toes.

This appears to be unsatisfactory as there are older and more deeply rooted characteristics to be taken into consideration which do not accord with it.

One group of species is decidedly aquatic, living along rivers, streams, and ponds, and feeding on water insects, fish, etc. Another group lives in forest, often far from water, and feeds on terrestrial invertebrates. The aquatic group has a narrow, compressed, mostly black bill, or at least black at the base; the upperparts are blue of different shades; the underparts are never very bright and are blue, white or rusty red, usually with blue on the sides of the breast and sometimes a more or less complete blue belt. The members of the second group possess a comparatively broad and flat bill, generally entirely red; the upperparts may have little or no blue, and often much shiny mauve and reddish chestnut; the underparts are vividly colored, generally tinged with yellow or mauve; there is never any blue on the sides of the breast, nor any tendency to a pectoral belt. The mauve gloss on the crown and the ear coverts is typical of most species. The great similarity in the coloration of the head in the species *picta* from Africa and *fallax* from Celebes and Sangir is very interesting.

It seems advisable to disregard the number of toes and to assign the various species of Alcedininae to two genera as follows:

1. *Alcedo* Linné 1758, WATER KINGFISHERS:

Synonyms: *Corythornis* Kaup 1848, *Alcyone* Swainson 1837.

Species with four toes: *hercules, atthis* (*semitorquata* included), *quadribrachys-meninting* (superspecies), *euryzona, coerulescens, cristata, leucogaster.*

Species with three toes: *cyano-pectus, argentata, azurea, pusilla.*

2. *Ceyx* Lacépède 1799, LAND KINGFISHERS:

Synonyms: *Ispidina* Kaup 1848, *Myioceyx* Sharpe 1871.

Species with four toes: *lecontei, picta, madagascariensis.*

Species with three toes: *lepidus, erythacus, rufidorsum, melanurus, fallax.*

AMER. MUS. NAT. HIST., *New York, March 10, 1950.*

NOTES ON HONEYGUIDES IN SOUTHEAST CAPE PROVINCE, SOUTH AFRICA

BY C. J. SKEAD

Now that I am no longer living on a farm it seems advisable to collate what little data I have accumulated on honeyguides and add it to the scanty knowledge we have of these birds, in this instance the Lesser Honeyguide, *Indicator minor minor*, the Greater Honeyguide, *Indicator indicator*, and Wahlberg's Sharp-billed Honeyguide, *Prodotiscus regulus regulus*.

The farm "Gameston" where these records were taken lies in the grass- and bush-covered upper reaches of the Kariega River, 15 miles southwest of Grahamstown, Albany district, Southeast Cape Province, South Africa. This veld-type, known as "bontebosveld," spreads over a large part of the southeast cape.

Although I have known the birds for many years the written records cover a period of about five years.

(1) THE LESSER HONEYGUIDE

Ecology.—This species prefers the scrub bushveld and more open acacia veld, sitting among the inner branches of the trees and bushes but making conspicuous flights in the open from one patch of bush to another.

Status.—I have recorded them in January, February, March, July, August, September, and December. This suggests they are resident and not migratory. They are very restless birds being seldom seen for more than an hour or so and, in my experience, usually one at a time, even when they parasitized a nest of Black-collared Barbets, *Lybius torquatus*, in our garden. But from July to September, 1949, two often consorted together, attracted, I think, by combs of honey protruding from the garden bee-hives. There were no barbets in the garden then.

Field Characters.—There are no striking features; their dull coloration is lightly offset by the golden sheen seen on the back when the light is good. The white outer rectrices are noticeable in flight, especially when fanned prior to alighting. The flight is the exaggerated, rather lackadaisical switchback so typical of honeyguides. The bird is restless, seldom sitting still for long.

Calls.—The birds are rarely heard. Even when two were together and one bird chased the other energetically they made no sound. Twice only have I recorded call notes. On February 15, 1947, and on

September 13, 1947, the calls were identical—a pretty, stuttering trill, quiet and not accented at all—'*Tttrrreee.*'

The call of the nestling is a quiet, rolling, squeaky noise heard continuously throughout the day and even into the night. I heard it at 8:15 p. m. when the nestling was 14 days old. It closely resembles the call of the chicks of its host, the Black-collared Barbet, and also the chick of the Greater Honeyguide. As the chick gets older the calling becomes less persistent.

Behaviour.—I have seen no displays whatever. The general disposition of the birds is one of "lazy indifference." When the two kept company from July to September, 1949, they were, for the most part, amiable but sometimes one for no apparent reason would attack the other (perhaps sitting in another tree) and chase it up and down the garden two or three times until the chased bird, closely followed, dived into a shrub where the two would sit panting heavily. Either the display would then cease or the aggressor would attack again. All this was done in silence.

The following records relate to the honeyguide's behaviour at or near the barbets' nest.

On February 15, 1947, the barbets showed no concern at the presence of a Lesser Honeyguide in the garden. The next day the honeyguide kept flying toward the barbets at their nest. They shrieked continuously and flew at it in attack, but the honeyguide merely moved away leisurely and returned immediately when the barbets flew back to their nest-tree. This lasted five minutes and occurred when the barbets' eggs were well incubated.

On March 2, 1947, I saw one arrive in the garden and fly directly, in the absence of the barbets, to the nest-hole which now contained barbet chicks. It peered in at the entrance a few times and then examined another hole which one of the barbets used for sleeping. There had been no honeyguide eggs in this brood.

On September 13, 1948, the barbets were not nesting or using the holes in the garden for sleeping, but when two were feeding in the garden at the time a Lesser Honeyguide appeared they immediately reacted—shrieking "alarmedly," something they never do to other birds. The honeyguide was in no way perturbed and in spite of the protestations casually looked into the old barbet nest as it passed by.

Guiding.—I have never known of this habit in this species.

Parasitism and Development of Young.—In the instance when the Black-collared Barbets were parasitized, I recorded the laying of the first egg in their nest on September 29, 1947. The second was laid on September 30, but unfortunately my observations were interrupted; on October 11 I found four eggs in the nest. On October 17 three eggs hatched and in the early morning of October 18 all four chicks were out.

Because one of the barbets remains in the nest-hole continuously as soon as the first egg is laid, the computation of an incubation period is difficult. There is no means of knowing how many days the bird

spends on the eggs, but it may be noted that all eggs hatched within 12 to 24 hours of each other. If we arbitrarily take from October 1 to October 17 as a rough incubation period the time is 16.5 days. This suggests that the incubation periods of the barbet and the honeyguide may be of similar duration, which is contrary to the situation between cuckoos and their hosts. Also, because there were four eggs in the nest, it would seem that the honeyguide did not remove a barbet egg when depositing her own because the normal clutch of these barbets is three.

All the eggs, which I did not handle, were plain shiny white and were of similar or identical size.

After the hatch it was impossible to see what was happening in the nest-hole because one or other of the barbets always guarded the nest for the first six days. On October 25, I could see only one chick in the nest so the other three chicks must have disappeared between October 17 and October 25, that is within the first week. The lighting in the nest was too bad to see whether the chick had hooks on the mandibles, but on the fifteenth day I noted "seems to have a hook at the end of upper mandible."

If we assume the hatching date of the honeyguide as October 17, the chronology of nestling development is as follows:

1st day. Blind; naked; skin pink. *12th day.* Still blind and unfeathered. *13th day.* Still blind; quills just appearing through skin. *14th day.* Eye three-fourths open; nostrils prominent and round; chick looks stubbly all over; grabbed lighted torch bulb lowered at end of cord. *16th day.* Saw chick in nest grab and lustily shake adult's wing. *17th day.* Chick feigned death when I looked in. Possibly first fear—reaction; feathers out of quills on abdomen and flanks, but not on back of head. *21st day.* Feathers out of quills on back. *22nd day.* Chick still maintains continuous calling, but stops now when I look in; beak still pink. *25th day.* Chick well feathered; grey below; light and dark brown above; beak pink; outer rectrices white. *26th day.* Chick almost as big as adult barbet; heard it making quiet peeping noise at 12:30 a.m. *28th day.* Saw chick defecate through adventitious hole in floor of nest-tunnel which is on a 30-degree slope from horizontal. This hole is about 6 inches from the bottom of the nest. *30th day.* Chick still calls quietly for long periods but not so continuously. *33rd day.* Beak still pink near gape, but horn-colored at tip; chick more silent. *35th day.* Makes rolling call when it hears foster-parent approaching with food and continues thus for half a minute after feeding; takes the food at the entrance. *38th day.* On looking in tonight I found the two barbets in the nest but not the honeyguide; it was there last night so must have emerged during the day.

The following day I saw the barbets in the bushveld, 300 yards from the nest. Both made the anxious '*snaaar*' call which they use to denote "apprehension" and possible danger when they have chicks.

I could not find the honeyguide, but from the barbets' behaviour I have little doubt it was at hand.

But as mentioned, the honeyguide did not return to the nest-hole that night as the barbets' own chicks would have done, and the next morning I saw the barbets emerge from their hole and fly away in the opposite direction from where I had seen them with their honeyguide the previous afternoon. Never again did I see the chick, and the subsequent activities of the barbets gave no hint of continued interest in it. From this it must be inferred that either the honeyguide had acquired immediate independence or had fallen to some predator. Its period in the nest had been 38 days against the 33 to 34 days of barbet chicks.

Although a pair of barbets inhabited this nest-hole continuously for three years, from September 9, 1945, to mid-September 1948, only once in three nesting attempts were they parasitized.

There was no indication as to how, or if, the young honeyguide disposed of the young barbets. I found no remains below the nest-hole and no bodies within. If the young are forcibly ejected, cuckoo-wise, they would have had to be trundled up a 30-degree slope for 19 inches, the depth of the nest-hole. Is a blind and feeble honeyguide chick capable of such a feat? Alternatively, if a 30-degree slope is within its scope could it perform a similar feat in a perpendicular nest-hole in which it might well find itself? This seems beyond its powers. One wonders whether the hooked points on the beak are used to kill the nest-mates whose bodies are then removed as debris by the foster-parents during nest sanitation.

Food.—The occasional visitors to the garden always flew to the bee-hives, settled at the entrance for a moment or two and then flew away. At the time the two birds were together, there were several honeycombs protruding from the hives. These were empty except for a few well-developed grubs in some of the cells. I removed a few of the combs and tied them to the branches of a tree where I could observe the birds' actions more easily. At first both approached the combs with the utmost caution, fluttering "nervously" above them or springing up in fright on touching them. However, they soon gained confidence and fed hungrily. One bird began eating at 2:58 p. m. and fed unceasingly until 3:22 p. m. (24 minutes). It then flew to another tree but three minutes later returned to its comb and fed for another 20 minutes, making a total feeding period of 44 minutes. The other bird fed at its comb for only 10 minutes. They ate pure wax, which they "nibbled" from the edges of the combs, and ignored the grubs in the cells. A day or two later I noticed that the grubs had

disappeared but these may have been taken by other birds, perhaps Fork-tailed Drongos, *Bhuchanga adsimilis*. Although dead bees always lay scattered near the hives I saw nothing to indicate that the honeyguides fed on them. The numbers of dead bees never seemed to diminish when the birds were about; nor did I ever see the honeyguides hawking live bees near the hives.

After a few days' feeding at the combs, the birds, normally timid, became much bolder and often entered an old box lying near the house steps, which contained the remains of wax from another hive. They also came to the bird-bath to drink but I never saw them bathe.

To the honeyguide chick the barbets fed the same food they give to their own young, that is, both insects and fruit.

Throughout its stay in the nest the young honeyguide defecated in the nest tunnel. These feces must have been removed by the barbets at first because the nest was clean after the chick's departure. But through two adventitious holes in the tunnel floor feces often fell. They contained the hard chitinous parts of insects and also the pips of youngberry fruit which grew in the garden beside the nest-tree. In this respect the honeyguide differed from barbet chicks who reject the hard insect material and pips before swallowing and whose feces, therefore, show nothing hard and undigested.

I sent the insect material to Mr. J. Sneyd Taylor, Government Entomologist at Fort Beaufort, Cape Province, who commented:

". . . seems to consist mainly of beetles of the chafer type, including those bright-colored ones found on flowers (*Scarabeidae-Melolonthinae*); also one *Cerambycid* (Longicorn). It is curious that although so much of the insects remains, there is little trace of the brightly coloured elytra."

Territory.—I saw nothing to indicate any territorial instinct in the adult honeyguide. Indeed, because of their uncommonness, it would appear almost impossible to solve this question. I believe the birds have an extensive range, and they are so scarce that the possibility of clashing with others of their kind is remote.

(2) The Greater Honeyguide

Ecology.—This form prefers the dense bushveld but ventures into less dense veld at times and, rarely, into openveld if there are isolated patches of bush.

Status.—It is apparently a resident. I have recorded them in all months except April, May, and October, with single immature birds noted in January, February, and July.

This species is much commoner than the Lesser Honeyguide but is not by any means a common bird. It is of solitary disposition, seldom remaining in any one place for long. Although we had three beehives in the garden the birds never haunted the vicinity. They would drop down to the hive entrances momentarily, in passing, but soon moved on.

They appeared quite unexpectedly at any time and seemed to roam about the veld without any fixed intentions.

Field Characters.—Usually the first intimation of a bird's presence is the chattering guiding call, but the plumage offers no ready and immediate field character. Closer inspection reveals the white ear-coverts, yellow beak, and yellow shoulder-patches of the male; but the yellow patches can be deceptive at times. The young are yellow below, which identifies them more readily, but I have always found that close scrutiny is necessary to satisfy myself that I have judged the sex of other birds correctly. The typical white outer rectrices of the honeyguides are present, as are the exaggerated undulations in flight.

Calls.—The guiding call is an unmusical, "unoiled," rolling call '*ch, wrrrt—ch, wrrrt*' etc., slow and repetitive, sometimes in an "anxious" tone if the observer is not following as assiduously as the bird would wish. At times it seems to slacken a little, as if the bird were losing interest, but soon returns to normal. There is no body movement or excitement during the calling, the bird sits quite still, often hunched up.

The guiding call commences unexpectedly and is directed either at individuals or groups. I have been walking through bush on my own and suddenly heard the bird call behind me. Often when working with a gang of natives chopping wood or hoeing maize I have heard a bird calling to us.

In January and February, 1948, a young bird often visited the garden. Its call was a pretty, tripping and musical '*prrreee-prōō*' (ōō as in coot) made with the head brought sharply forward and downward. I have heard this in July, too. On rare occasions I have seen a female flying about the garden examining the empty nest-holes and making a soft '*charracharracharra*' on alighting.

The call of the nestling is husky and perpetual, just like that of the Lesser Honeyguide nestling. This immature Greater Honeyguide call is not dissimilar to the guiding call of the adult but of course undeveloped. It can be heard, greatly accelerated and intensified, 75 yards from the nest whenever a foster-parent approaches with food. This happens during the later days in the nest.

Behavior.—Because I have never seen more than one at a time there are no displays to report. It seems a most inconspicuous bird with no behavior characteristics worth comment.

In January, 1949, when one arrived in the garden it was promptly and determinedly attacked by a Brown-hooded Kingfisher, *Halcyon albiventris*. A pair of these kingfishers was often in the garden but never attacked any of the many other birds there. Their nesting and sleeping hole was tunneled into an earth bank 150 yards from the garden and their action towards the honeyguide made me wonder whether they had recognized it as an enemy in the way barbets recognize Lesser Honeyguides and weaver-birds recognize cuckoos. The kingfishers were not nesting at the time.

Guiding.—I have known guiding to take place in May, June (twice), July, August, and November, that is in every season. It is done by both sexes and at any time of the day.

The general plan is for the bird to call from the top of a bush or tree in sight of its "victim." When followed, it allows the person to get within about 10 yards and then flies to another perch not necessarily in sight of its follower, in fact more often not. There it awaits the person's arrival and the process is repeated. On arriving at the hive it sits either above or slightly to one side, calling as before. Should the person get too close to the bird it flies discreetly to a safe perch but never far. There are slight individual variations in technique.

I have never encountered an immature bird guiding nor have I seen more than one bird at a hive. Flocks have never come my way and I have never heard anyone mention them. The natives on the farm, when asked, repeated the story of birds guiding people to snakes but in the absence of actual instances this seems illusory. In addition they referred to people being led to dead animals, but this I believe to be apocryphal, especially in view of my experience as a farmer that natives are singularly inept at finding dead beasts in the veld. It is certain that natives make good use of honeyguides in finding beehives because, apart from honey being a great delicacy, it is highly regarded for the fortifying and intoxicating stimulus it gives to their home-brewed beer.

I have often wondered whether these honeyguides call to baboons, and if so whether the baboons appreciate their intentions.

Below I list seven personal experiences of guiding, both successful and unsuccessful. In no instance did I remove the combs and offer them to the birds.

No. 1. May 12, 1941. Led to a thicket where the bird sat seven feet above the hive built in a hole in the ground; bird persisted with its calling while I was at the hole; guided for 20 yards in three minutes.

No. 2. November, 1943. Bird started calling at edge of wooded gully (kloof); I knew of a beehive in an old tree-stump near by, and the bird led me to it through the thick bush of the kloof; natives had opened this hive in the past but the bees had always remained; the bird sat on a bough a little above the hive while I examined the spot; guided for 20 to 30 yards in about five minutes.

No. 3. July 18, 1945. In dense bush one called 10 yards behind me; I followed, and the bird flew 68 yards to the next perch, then on another 21 yards where it settled on the lower branches of tall, scrubby bushes growing beside a dam; while I was crawling about in search of the hive the bird moved in a narrow circle but no sign of bees could I find. Then it flew out of the thicket, crossed the dam, and settled on a dead tree. I walked towards it but it flew straight back to the same area in the thicket. Soon it ceased its calling and disappeared; I gave up too. Next day I revisited the spot. There was no sign of the bird and still less of the bees. The day after, I searched once more and, quite by chance, found a hive about 11 yards from where the bird had so consistently indicated and in a position over which the bird had flown on its way to the thicket. Why it did not settle on the bushes beside the hive, as it might well have done, must remain unanswered. Guided for about 100 yards in 20 minutes.

No. 4. June 15, 1949. This was the longest "guide" I have known, with the bird calling strongly from perch to perch before pausing in a large bush where its calls grew quieter. After 10 or 15 minutes the calling ceased and the bird disappeared. I searched the bush and its surroundings with the utmost care but without finding a trace of bees. Four times I returned on subsequent days, twice with reliable native boys who are adept at finding hives—all without success. It must have been a false alarm. At one stage during guiding the honeyguide was chased for some distance by a Cape Glossy Starling, *Lamprocolius nitens phoenicopterus*, but it soon returned to its course which I do not think was affected by this interlude. At one perching site the bird clung to the perpendicular branch of a tree, woodpecker-wise. Guiding distance was about 320 yards in 10 to 15 minutes.

No. 5. June 23, 1946. A native boy and I were walking through the bush when we heard and saw a female honeyguide calling from atop a tree eight feet high. We walked toward the bird which flew away, calling, and settled on another tree 36 yards away. We walked up to her but she flew straight back to her first tree. The signs below seemed most unpropitious but we found a small antheap barely protruding above ground level. In this was a small slit, slightly larger than the body of a bee, through which a slow stream of bees was entering and leaving.

No. 6. December 12, 1946. Although the birds often settle at the hives in the garden only once have I heard them give the guiding call there and I do not think it was directed at anyone. It is rather strange that with people constantly coming and going near by, the birds should not try to attract them.

No. 7. August 26, 1948. I was in dense bush working with a gang of chattering natives whittling rough poles. Suddenly an apparent female settled on top of a bush before us, calling. She must have been attracted to the sound of voices. I promptly followed her call, via three perches, to a kloof where the calling stopped and the bird disappeared. During guiding the bird settled on the ground for a moment, something I had never seen before.

At one stage I thought the bird was guiding me to the hive mentioned in Number 2 above, as it may well have been doing, for the hive was about 50 yards down kloof from where the bird stopped calling.

When I returned to the natives they were most emphatic that the bird could only have been "telling lies" because no bees would be out in such cold, windy and overcast weather. That may be true but that hive had a wide opening with portions of comb visible from outside so that the bird might well have known of the hive's whereabouts from past experience without necessarily seeing the bees on this occasion. I was guided for about 100 yards in four minutes.

There are a great many wild hives dotted about the veld and in kranses (cliffs), so that the scarcity of honeyguides cannot be due to lack of bee-food or its by-products. The birds do not haunt the vicinity of hives, as well they might. I was out in the veld every day of the year but the above scanty records emphasize how infrequently the birds were encountered. Had it not been for the garden hives I would have seen much less of them.

The question arises: How do the birds find hives? Do they follow the bee flight-lines? Do they encounter hives fortuitously? Do they remember the locations of hives found by them in the past? Probably all these apply.

After examining a hive and not rewarding the bird for having led me thereto, I have never seen it show "annoyance."

Parasitism and Development of Young.—In August, 1948, the Black-collared Barbets, after three years' sojourn, deserted their nesting and sleeping hole in the garden. This remained untenanted until December when a pair of Yellow-throated Sparrows, *Petronia superciliaris*, arrived and built their lichen nest at the bottom of the hole. Several factors prevented regular observation of their nesting habits. Firstly, they are exceedingly "nervous" birds who desert their nests with little provocation. Secondly, their nest, built at the bottom of the tunnel, covered most of my observation "window" and this meant too great a disturbance of nesting material. Thirdly, these sparrows build a bower of feathers over the nest-cup which makes observation by the torch-and-mirror method impossible. Therefore, I left the sparrows alone hoping to encourage their "confidence" for the future but little expecting them to be parasitized.

However, on December 12 I heard what sounded like the constant purring of a honeyguide chick in the hole. I opened the window and with difficulty extracted a young honeyguide. The feathers were just emerging from the pointed quills all over the body; the back and wings were olive-brown; rump white; abdomen and breast yellowish-white, and throat bright yellow; eye about a quarter open. Based on the

Lesser Honeyguide development already described, this chick would have been about 16 days old.

On the "heel" of the tarso-metatarsus was a little rosette of scales similar to that on a Black-collared Barbet but which I did not observe on the Lesser Honeyguide, although it might well have been there. But, most interesting, were the hooks on the tips of both mandibles. The base of the upper hook, where it joined the beak, extended slightly over the upper mandible and, protruding therefrom, in a position where the egg-tooth would occur in a normal beak, was a minute conical protuberance which had probably served the purpose of an egg-tooth.

The chick left the nest on January 5 and never returned. The sparrows left at the same time and were not seen again. If the chick was 16 days old when I first saw it, then the nestling period would have been about 40 days which is close to the 38 days of the Lesser Honeyguide. Therefore, when they leave the nest the birds can be considered as well-developed.

I have never seen the egg of this bird; nor did I see any signs of honeyguides haunting the sparrows' nest at the time of egg-laying.

In some way the young honeyguide must have disposed of the young sparrows because there was no sign of them or their dead bodies in the nest or on the ground below.

Food.—Although I have frequently seen them settle at the entrance to the garden hives I never saw them feed there, as the Lesser Honeyguides did.

They are nest robbers, a fact disclosed when I went to investigate the anxious screechings of a pair of nesting Bar-throated Apalis, *Apalis thoracica*, in a thick patch of bush. As I approached the bush, I saw a Greater Honeyguide fly out with an egg in its beak and disappear into a kloof. I followed but could not see the bird. After a minute it emerged without the egg and flew towards the Bar-throats, but on seeing me it veered away. I searched inside the kloof without finding the remains of the egg which perhaps was eaten by the honeyguide. When I examined the apalis' nest it was empty. As the honeyguide was a male it could not have intended laying there. These warblers are parasitized by Klaas's Cuckoo, *Chrysococcyx klaasi*, but I have not heard of honeyguides using them.

The only food I could identify as being fed to the chicks was a grasshopper. Not even the droppings were available because the sparrows removed them promptly during nest sanitation.

Territory.—From the remarks passed from time to time in the text it is obvious that to impute territory to these birds is almost impossible.

(3) WAHLBERG'S SHARP-BILLED HONEYGUIDE

Status.—It is much less common than either the Lesser or Greater Honeyguides, and because of its likeness in the field to the Dusky Flycatcher, *Alseonax adustus*, can be easily overlooked. It seems to prefer dense cover. Whenever I have tried to stalk one when it has emerged it has always dived into a bush, scrambled through, and then flown out on the opposite side.

I have recorded it in January, June, September, and October which suggests that it is resident, but it must be a very "restless" bird. I have seen only singles and those for brief spells, perhaps five minutes, at a time.

Field Characters.—A drab bird with no distinctive features. It has both the white outer rectrices (seen in flight or on alighting) and also the exaggerated undulating flight common to the other two honeyguides dealt with here. Given a good view of the bird, an extremely difficult proceeding, the slow bobbing of the head is a good recognition mark. It is a sort of circular rolling of the head as though some constricting force around the neck were causing the bird to ease the discomfort by moving its head all the time.

Calls.—None heard.

Guiding.—None seen.

Parasitism.—None encountered.

Although the Scaly-throated Honeyguide, *Indicator variegatus*, is listed as occurring in the Albany district and cannot, therefore, be far from "Gameston" I never saw it at all.

"Gameston," Highlands Rail, Cape Province, South Africa, May 2, 1950.

LIGHT INTENSITY AND THE ROOSTING FLIGHT OF HERONS IN NEW JERSEY

BY HENRI C. SEIBERT

ON August 25, 1948, the writer located a heron roost situated at the south end of Ocean City, Cape May County, New Jersey. The birds were noted returning from the marshes to the west and settling down for the night in a small growth of cherry trees. The tallest tree in the area was a cedar, scarcely over 25 feet tall. The majority of the cherry trees were less than 15 feet, but formed a dense, almost impenetrable growth. A rough count of the birds gave a total of 359 and included the following species: Little Blue Heron, *Florida caerulea;* American Egret, *Casmerodius albus;* Green Heron, *Butorides virescens;* and Black-crowned Night Heron, *Nycticorax nycticorax.* Several birds were already on the roost when the count was begun and as a result the total evening's count was far too low.

The following evening observations were started at 5:53 p. m. and no bird was detected on the roost. From then on the herons were counted and timed at five-minute intervals as they entered. The Night Herons, having spent the daylight hours on the roost, were similarly counted and timed as they left. Observations were made on August 26, 27, 30, 31, and on September 2 and 6.

The same roost was studied again the following year and counts made as before on August 17, 19, 24, and on September 1, 8, and 13. In addition, the morning flight was observed on August 25, and on September 2 and 9. A calibrated Weston illumination meter was used to measure the light intensity directly overhead at five-minute intervals. Each day's count for both years is given in Table I.

From this information an attempt was made to determine the size and composition of the colony, the relationship of roosting flight to such factors as light, temperature, and tide, and to relate differences in roosting behavior with the migratory status of the species concerned.

THE COLONY IN 1948

If the data of August 25 are excluded, since they are obviously incomplete, the average size of the 1948 colony was about 536 birds. Little Blue Herons comprised by far the largest percentage of birds in the roost, being 71.3 per cent of the total observed. The members of this species were tabulated as those with the adult blue plumage and those with the immature white. From two to four birds with a mixed plumage were observed, but since the feathers were predominantly

blue, and since the species is known to breed in this pied plumage, they were classed with the adults.

Snowy Egrets, *Leucophoyx thula*, would seem to have arrived at the roost on August 27, as indicated by the single specimen noted in Table 1, and then to have increased in numbers on succeeding days of observation. Actually, the writer was not expecting to find Snowy Egrets and only by chance happened to note the yellow feet on the one bird.

TABLE 1

POPULATIONS OF HERONS COUNTED IN 1948 AND 1949. SEE TEXT FOR DISCUSSION OF COUNT OF SNOWY EGRETS

	August			*September*				
1948	*26*	*27*	*30*	*31*	*2*	*6*	*Average*	*Per cent*
American Egret	37	41	37	44	48	31	39.7	7.4
Little Blue (adult)	42	46	25	22	21	18	29.0	5.4
Little Blue (immature)	332	384	315	265	305	324		
							353.3	65.9
Snowy Egret		1	56	86	40	12		
Green Heron	49	68	98	60	87	76	73.0	13.6
Black-crowned Night Heron	34	27	42	50	53	38	40.7	7.6
Louisiana Heron	1	1	1		1		0.7	0.1
TOTALS	495	568	574	527	555	499	536.3	100.0

	August			*September*				
1949	*17*	*19*	*24*	*1*	*8*	*13*		
American Egret	101	109	130	127	109	105	113.5	14.4
Little Blue (adult)	151	146	129	131	79	85	120.2	15.3
Little Blue (immature)	605	367	495	225	323	335		
							453.8	57.8
Snowy Egret	4	121	42	115	57	34		
Green Heron	87	72	100	45	39	18	60.2	7.6
Black-crowned Night Heron	47	40	41	30	30	41	38.2	4.9
TOTALS	995	855	937	673	637	618	785.8	100.0

As a result, at the next observation period, the colony was approached at closer range and all apparent immature Blue Herons were examined as carefully as possible. The total of Snowy Egrets thereby greatly increased, reaching a high of 86. Unfortunately on the days following this high total count, partly cloudy weather made observation difficult around sunset and many Snowy Egrets were undoubtedly classed as immature blues. Once the birds had perched it was impossible to follow them in the trees and still keep count of other birds coming in; thus the Snowy Egrets had to be identified in flight before reaching the roost. A total of immature Blue Herons and Snowy Egrets together gave a fairly constant count, from 332 to 385 birds, indicating that some Snowy Egrets were missed on the cloudy days. In view of the inaccuracy of the Snowy Egret count they have been lumped

with the immature Blue Herons in the following data unless specifically stated otherwise.

One Louisiana Heron, *Hydranassa tricolor*, was observed on four different days as indicated in Table I.

THE COLONY IN 1949

The colony in 1949 averaged about 786 birds, an average increase of 250 birds over the 1948 colony. Again the Little Blue Heron was the predominant species, being 73 per cent of the total birds counted (including all Snowy Egrets). The ratio of Little Blue Herons to the total colony was, therefore, approximately the same for both seasons. In the 1949 total the adult Little Blues were nearly one-fourth (26.1%) as many as the immatures, whereas in 1948 they were only 8.2 per cent. On August 29, 1929, Stone (1937: 140) found that one-quarter of the Little Blues he tabulated at one roost near Bennett, Cape May County, were adult; two days later a more accurate count gave 124 to 400.

American Egrets increased in number and constituted a greater part of the colony in 1949; both the Black-crowned Night Heron and the Green Heron showed a slight decrease. What little evidence was obtained indicated that the Snowy Egret increased slightly, although the error in the counts may have been as great as 100 per cent.

The colony did not maintain stable numbers during the periods of observation. The 1948 count showed an increase leading to a peak on August 30 followed by a progressive decline. The relatively low count of August 31 was undoubtedly due to the fact that the birds were frightened out of the colony and in their short flight before settling down again new arrivals were overlooked in the confusion. The 1949 colony showed a similar, but more striking, decrease after August 24, occasioned by the disappearance of 200 immature Little Blue Herons (and Snowy Egrets?) and a reduction by half in the population of Green Herons. The count of August 17 was described as not being a good one because of two incoming flocks too large for accurate count, and because the roosting birds were flushed out twice. Under such circumstances an error of 100 birds could easily have been made. The counts of August 19 and 24 were described as good and the peak in numbers, therefore, occurred between August 24 and September 1, in agreement with the observations in 1948. Urner (1929–1930) counted the maximum number of Little Blue Herons at Newark Meadows on August 30, but the peak for American Egrets was much earlier, August 16.

The 1948 data indicate that among the Little Blue Herons, the adults left the area earlier than did the immatures. In the first two counts the ratio of adults to immatures was 12.7 and 12.0 per cent,

and by September this had dropped to 6.1 and 5.4 per cent. The 1949 data, having been accumulated earlier, show first an increase in the proportion of adults and then a decrease, there being 25 per cent on August 17, 38.5 per cent on September 1, and 21 and 23 per cent on September 8 and 13, respectively. It must be remembered that these ratios include the Snowy Egret and are only valid with the assumption that the latter species maintained a constant ratio in numbers with the immature Little Blue Herons.

In both years the American Egret maintained a relatively constant number of individuals as did the Black-crowned Night Heron. The greater fluctuation in numbers showed by the latter species can be attributed to the daytime roosting habits and the probable disturbances by persons walking through the area.

Whereas the decrease in the number of Little Blue Herons can be explained by their tendency to migrate southward earlier than either the American Egret or the Black-crowned Night Heron, the sudden decrease in numbers of Green Herons between August 24 and September 1 in 1949 is rather puzzling. There is the possibility that they may have selected another roosting site.

Although some Great Blue Herons, *Ardea herodias*, were seen on the marshes, none ever attempted to join the other species at the roost.

TIME AND SEQUENCE OF ARRIVAL AT ROOST

Since the herons were tabulated at five-minute intervals, a frequency distribution was set up wherein the interval containing sunset was regarded as the origin and the others as plus or minus departures from it. The calculated mean, therefore, expresses arrival time in minutes before or after sunset. For deriving the mean of all observations the frequencies were shifted so that the intervals containing sunset coincided. The mean arrival time for all observations in minutes before or after sunset is given in Table 2, together with data calculated from Urner's (1929–1930) report. For the Black-crowned Night Heron the data represent mean departure time.

The peak of arrival during the entire observation period for the Little Blue Herons varied between 17 and 15 minutes before sunset and for the American Egret, between 15 and 10 minutes (Table 2). Green Herons arrived much later, from seven to 14 minutes after sunset. About four to nine minutes later, the outbound movement of the Night Herons was at its peak. In all cases there was considerable spread in time as indicated by rather large standard deviations. In spite of this, the mean times for Green, Night, and white Herons (the term white heron is used collectively for the American and Snowy

Egrets, adult and immature Little Blue Herons) differed significantly. Although decreasing light caused a corresponding decrease in the ability to differentiate Snowy Egrets from immature Little Blue Herons, some observations seemed to indicate that the former were actually the earliest of arrivals. On August 30, 1948, 55 Snowy Egrets arrived at the roost before any Little Blues appeared; on August 31, 38 Snowy Egrets were observed before the first Little Blue; on September 2, 22 Snowy Egrets were already on the roost when the observations started.

TABLE 2

MEAN ARRIVAL TIME OF HERONS AT THE ROOST (DEPARTURE TIME FOR THE BLACK-CROWNED NIGHT HERONS) IN MINUTES BEFORE SUNSET

		1948	*1949*	*Urner*
Little Blue Heron	$M =$	16.6±0.27	15.1±0.26	17.5±0.45
	$\sigma =$	12.8±0.19	14.2±0.18	21.2±0.31
American Egret	$M =$	9.6±1.04	14.5±0.59	17.6±1.23
	$\sigma =$	16.1±0.74	15.3±0.42	17.1±0.87
Green Heron	$M =$	− 7.2±0.71	−14.4±0.77	
	$\sigma =$	14.9±0.48	12.4±0.47	
Black-crowned Night Heron	$M =$	−16.0±1.00	−18.5±0.73	
	$\sigma =$	14.7±0.71	11.0±0.52	

Little Blue Herons arrived in small groups of three to ten, then in ever increasing flocks of 20 to 40. Flying about 100 feet up, they approached the roost rather closely, then made sudden twisting dives at sharp angles into the trees. Snowy Egrets behaved in a similar fashion. American Egrets, on the other hand, usually glided in at less than 50 feet, very often approaching the roost at tree-top level. They arrived in groups of two to five, seldom more, and frequently in company with Little Blues. The white herons normally landed on the top of the trees where they were rather conspicuous, then gradually and, at times almost imperceptibly, "melted" into the vegetation and out of sight.

Green Herons approached at an intermediate height, very seldom more than 50 feet, and flew directly to the roost. This species had a tendency to segregate from the larger herons and selected a spot to the side of, but still adjacent to, the main roost. The Green Herons arrived for the most part singly or in pairs, never in flocks. Occasionally a bird would fly off the roost soon after arriving. The larger herons flew off a short distance and returned, but Green Herons usually disappeared from sight. In all cases, birds leaving the roost were tabulated as such and were corrected for in all totals so that no bird was counted twice.

Night Herons began leaving the roost in ever increasing numbers around sunset. Often a few individuals were observed coming from

their hiding places and perching near the outer edge of the bushes and trees, waiting for the proper time to fly off. The majority of these birds departed from the bushy vegetation that surrounded the trees of the roost.

The lone Louisiana Heron that was observed on four fifferent days was an early arrival, being clocked between 52 and 34 minutes before sunset for an average arrival time of 40 minutes. On the last day it arrived earliest, hesitated briefly on the perch, then flew off and was never seen again.

Factors Influencing Roosting Time

An attempt was made to determine the primary factors controlling the herons' movement to and from the roosting site. The most obvious influence was the time of sunset. In Figure 1 the mean arrival time of herons at the colony (departure for the Black-crowned Night Herons) is shown relative to sunset. In 1949, the results showed a remarkably close relationship between sunset and arrival time of Little Blue Herons, varying between 12 and 20 minutes. This curve is closely paralleled by that of the American Egrets, except for an unusually late arrival on August 24. Even the Green Herons, whose major arrival occurred after sunset, showed good agreement although the fluctuation was more than in the case of either the egrets or the Little Blue Herons.

In 1948 the relationship of flight to sunset time was less rigid, although the species arrived at the roost in the same order as in 1949. The American Egrets particularly showed a wide variation in mean arrival time, from 15 to 0 minutes before sunset. Also, the American Egrets arrived at a significantly later time in 1948 than did the Little Blue Herons, whereas in 1949 the two species arrived at about the same time as also did Urner's birds. On the other hand, the Little Blue Herons and the Green Herons came to the roost at significantly earlier times. No obvious explanation is forthcoming for these disparities. The 1948 season had more rain and the evenings were often cloudy while 1949 was dry throughout August. The greater extent of wet marsh with the possibility of an increased and more easily obtainable food supply along with a seemingly earlier sunset occasioned by gathering clouds may have caused the birds to return earlier.

The Night Herons left the roost 2.5 minutes earlier in 1948 than in 1949. This difference was in large part the result of the early departure of August 26. As this was the first time that I had approached the roost at close quarters, these herons may have been made nervous by my presence, especially since I moved around to some extent locat-

ing a favorable spot from which to observe the incoming white herons. On August 27, the roosting Night Herons were frightened away by a passerby, and their departure time (10.3 minutes before sunset) was not included in the graph or in the calculations used to determine mean departure time in Table 2.

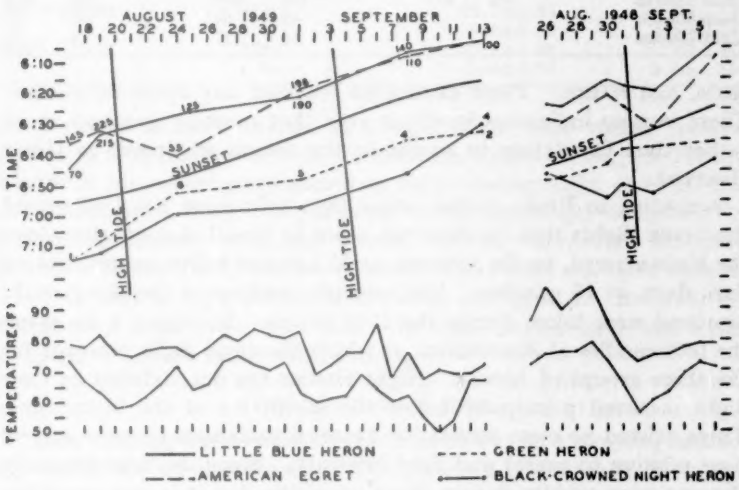

FIGURE 1. Mean arrival time of herons at the roost (mean departure time for Black-crowned Night Herons). Numbers on 1949 curves represent light intensity in foot-candles. Lower curves are maximum and minimum temperatures.

Urner pointed out the irregularities in roosting time and attributed these in part to the condition of the sky, noting that on dark cloudy evenings the birds roosted earlier. He described a thundercloud darkening the sky at 4:30 p. m. (= 3:30 E. S. T.) at which time 20 birds arrived to roost and all left when the sky cleared soon after. On a dark, cloudy evening, Stone (1937: 140) observed an entire colony of 522 birds arriving within a 45-minute period. A similar observation was made in the present study on August 18, a dark and rainy day. At 70 minutes before sunset, with the light in the sky equal to only 55 foot-candles, the roost was found to contain many birds and many others were coming in. Again on September 7, a cloudy day, a large number of herons was already roosting 65 minutes before sunset. These were frightened off; within the next 15 minutes, 368 herons had flown in. In both this and the previous example above, the birds were restless, "bickering" with each other more than was customary. The majority of the flock would suddenly fly off, wheel in a long semi-

TABLE 3

COMPARISON OF THE MORNING AND THE PREVIOUS EVENING'S COUNT

	August 24 and 25		*September 1 and 2*		*September 8 and 9*	
	p.m.	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*
White Herons	796	823	598	669	568	620
Green Herons			45	64	39	39
Night Herons			30	27	30	26

circle, and return. These excursions rendered any count impossible. There was no indication in either year that roosting occurred at an earlier time in relation to sunset as the season advanced, as Urner observed.

According to Urner, factors other than light must have influenced the heron flights that he observed, since he found that on clear days the birds arrived, on the average, at 25 minutes before sunset, but on dark days, at 18 minutes. Photoelectric readings of the sky directly overhead were taken during the 1949 census. In Figure 1 are given the foot-candles of illumination at which the mean flight occurred for the three groups of herons. Night Herons are not included as their flight occurred principally below the sensitivity of the instrument. There existed no close correlation between variations in mean arrival time relative to sunset and light intensity. Since the light intensity changes very rapidly during this part of the day it is not surprising that the birds should arrive over a wide range of values. One can say that the white herons arrived in major numbers when the intensity was between 100 and 200 foot-candles, but that individuals or small flocks would come to roost in a range between 1800 and 0 foot-candles.

The same can be said for the Green Heron except that its main flight occurred below 6 foot-candles of intensity. Its range was from 100 to well below one foot-candle. If any bird arrived when the light was greater than 100 foot-candles, it would stay for only a short time before flying out into the marshes again. If the flight of Night Herons is compared to the light intensity that occurred at sunset (Table 5), using this value as an indicator of the condition of the sky, there existed a closer relationship between their departure from the roost and the light intensity than existed between the light intensity and the arrival of the other herons.

Maximum and minimum daily temperatures are shown on Figure 1. In 1948, one might surmise that the late average arrival of herons on August 31 and September 2 may have been related to the sharp drops in temperature that began on August 30. Unfortunately the 1949 data are so uniform that no marked change in arrival time can be

TABLE 4

MEAN DEPARTURE TIME (MEAN ARRIVAL FOR NIGHT HERONS) IN MINUTES BEFORE SUNRISE

	August 25	*September 2*	*September 9*
White Herons	M=6.6±0.11	11.1±0.12	12.5±0.10
	σ =3.1±0.08	3.1±0.08	2.5±0.07
Green Herons	M=	29.7±0.55	27.6±1.05
	σ =	4.4±0.39	6.5±0.74
Night Herons	M=	32.3±1.91	30.9±1.90
	σ =	9.9±1.35	9.7±1.34

associated with any change in temperature. One might further postulate that the late arrival of American Egrets on August 24 was related to the cooler temperatures on the preceding night, and that the American Egret, being a larger bird, would take longer to restore its energy equilibrium than the smaller herons. However, the cool period of September 10 was not reflected in any later arrival of Egrets.

The period of high tides is also shown in Figure 1. In 1949, its influence, if any, was not evident. In 1948, it may have had some delaying action on the white heron flight.

THE MORNING FLIGHT

Three morning flights were observed; each was on a morning following one of the evening counts. This provided a rough check on the accuracy of the evening's count and on the tabulating technique in general. Unfortunately on the first morning, the writer arrived too late to tally all of the Night and Green Herons, but did arrive before the white herons had begun to leave. A comparison of the counts is given in Table 3. Except for the Green Herons tabulated on September 1 and 2, the agreement in totals runs close to 10 per cent. The mean departure time for the white and Green Herons and the mean arrival time for the Night Herons are given in Table 4. The Night Herons' peak of arrival occurred about one-half hour before sunrise when the light intensity was still below one foot-candle. Green Herons began leaving soon after, before there was sufficient light to register on the photometer. Between six and 12 minutes before sunrise occurred the mass movement of the white herons, the light intensity measuring 20, 12, and 18 foot-candles on each of the three mornings. The smaller standard deviations, indicated in the morning counts, especially that of the white herons, compared to that of the evening flights should be noted. It took only 20 to 25 minutes to empty the colony of herons, whereas their arrival was spread out over an hour or more. In the morning, a few individuals left first, followed shortly after by large mass-movements. Thus, in the three observations made, 530, 412,

TABLE 5

COMPARISON OF MAXIMUM TEMPERATURES, LIGHT INTENSITY AT SUNSET, AND MEAN DEPARTURE TIME IN MINUTES AFTER SUNSET FOR BLACK-CROWNED NIGHT HERONS

	Degrees Fahrenheit	*Minutes*	*Foot-candles*
August 17	79	19.3	30
August 19	82	22.0	55
August 24	78	14.0	22
September 1	83	22.0	45
September 8	76	25.8	35
September 13	72	9.9	20

and 510 white herons left within a five-minute period. These large flocks prevented any attempt to differentiate American Egrets, immature and adult Little Blue Herons, much less any Snowy Egrets. As a consequence they are all lumped together.

DISCUSSION

A comparison of mean and median values showed the latter to be shifted to the right, indicating a left skewed distribution. In other words, the birds arrived at the roost at an increasing tempo, reached a maximum in traffic volume, then declined rather abruptly. This pattern seems reasonable enough, but the curious fact is that the Night Herons left their roost in the same manner and not the reverse.

The curves of the morning flights are skewed to the right, indicating a rapid increase in movement from the colony followed by a gradual slackening, terminating in a few stragglers that left in small groups. Night Herons responded in the same fashion even though they were coming in. Between 10 and 20 foot-candles of light apparently stimulated the white herons, whereas in the evening by the time the light was down to 20 foot-candles, well over 90 per cent of these birds had settled in the roost. This indicates a lower threshold stimulus or release from the inhibiting influence of darkness for the morning flight, especially since in the evenings the herons were stimulated, at their feeding grounds, to return to the roost at a period earlier than they actually arrived. The distances traveled by these birds is not known. During the day large numbers were found feeding within a mile of the roost, but since these birds were also found commonly scattered all the way from Atlantic City to Cape May it was not possible to learn to which roost each belonged. The behavior of the Green Heron was the same. In the evening, the mean arrival time of this species occurred between six and one foot-candles, but in the morning the mean flight was under way between five and ten minutes before one foot-candle was registered. Night Herons left the roost in the evening when the intensity of light was down close to one, or

slightly less, foot-candle. In the morning they returned at 11 or 12 minutes before the instrument registered one foot-candle. In the case of these birds the threshold was higher in the evening than in the morning. Thus the departure of all night-roosting herons from the roost occurred at a lower light threshold than the return flight, whereas the departure of day-roosting herons occurred at a higher threshold. The conclusion is that superimposed on the light stimulus may be an urge to satisfy the hunger drive. The day-feeding herons may be considered to leave the roost in the morning at a lower light intensity threshold because of empty digestive tracts, but with full stomachs they respond to a higher threshold of light by returning to the roost earlier. The Night Herons, having fed during the night, return earlier (at a lower light intensity) in the morning, but in the evening their hunger causes an earlier (at a higher light intensity) departure.

The progressively earlier morning departure of the white herons (Table 4) is significant mathematically; what its biological significance may be is not apparent. Whereas September 9 was a slightly brighter morning than the others, August 25 was brighter than September 2. The minimum temperatures for the nights in question were 72, 63, and 62° F. The cooler nights, together with their increasingly longer duration, may have caused the birds to expend sufficiently more energy to keep up their normal metabolism. Their greater hunger in the morning would then cause them to leave the roost at an earlier time. It is admitted that these data are too meager to prove the point. On the other hand, since Night Herons spend the day at the roost, their departure time may be compared with the maximum temperatures during the day. These data are given in Table 5. With due allowances, it can be seen that the lower the daytime maximum temperature, the earlier the birds left the roost. The sum of the mean hourly temperatures would obviously be a better basis for comparisons. At such time when the temperature falls so low and the nights become so long that the urge or need to leave the roost occurs before there is sufficient light to which the birds are accustomed, then the disruption in the energy balance must be compensated by moving to regions of longer daylight and warmer nights, that is, southward (Seibert, 1949).

During the cool months, at latitudes distant from the equator, nocturnal birds are at an advantage since associated with the cooler temperature is a longer night for feeding. In this case, it is interesting to note that the Black-crowned Night Heron, of the herons in New Jersey, is the earliest spring arrival and the latest fall migrant. During open winters it can be found throughout the year. The Green Heron is the next earliest migrant and this fact can be correlated with the species' possessing a longer feeding day than any of the white herons.

SUMMARY

1. A count was made on a heron roost during the late summer of 1948 and 1949 at Ocean City, New Jersey.

2. The time and sequence of arrival and departure of four species to and from the roost were tabulated. It was found that:

a) The mean arrival time of Little Blue Herons, American Egrets, and Snowy Egrets was between 16 and nine minutes before sunset;

b) The mean arrival time of Green Herons was between seven and 14 minutes after sunset;

c) The mean departure time of Black-crowned Night Herons was between 16 and 19 minutes after sunset.

In the morning the same sequence occurred in reverse.

3. Time of sunset and sunrise was found to be the most important factor controlling the arrival and departure of all species in the morning and in the evening.

4. The condition of the tide had little, if any, influence.

5. All night-roosting herons departed from the roost at a lower mean light intensity than that when they returned, whereas the day-roosting herons departed at a higher intensity than when they returned.

6. A causal relationship between migration dates, day and night feeding habits, time of arrival and departure to and from the roost, and the time spent on feeding activities is suggested as follows:

a) That herons leaving the roost to feed respond to a lower light intensity threshold than those returning to the roost because of an added hunger stimulus;

b) That on nights of cool temperatures, night-roosting herons leave the roost earlier in the mornings; on days of cooler temperatures, day-roosting herons leave earlier in the evenings because of increased energy demands;

c) That the earlier spring migration of the Black-crowned Night Heron in New Jersey is associated with its night feeding habits and that the Green Heron is the next earliest migrant because it possesses a longer feeding day.

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Contribution No. 45 from the Department of Zoology, Ohio University, Athens, Ohio, February 21, 1950.

A NEW RACE OF THE BLACK-CAPPED CHICKADEE FROM THE ROCKY MOUNTAIN REGION

BY WILLIAM H. BEHLE

SPECIMENS of *Parus atricapillus* collected recently in Utah show differences from the populations of the western, desert portion of the state and of the eastern section. Duvall in his revision of the species (Auk, 62: 49–69, 1945) comments on the different appearance of examples from certain localities in Idaho, Wyoming, Montana, Colorado, New Mexico, and Utah, which he considered variants of the race *P. a. septentrionalis*. Many of these specimens were very old and he attributed their brown color to "foxing." They correspond, however, in their color characters to fresh examples from northeastern Utah. Thus it appears that there is a differently characterized population in the Rocky Mountain area which is designated as

Parus atricapillus garrinus, new subspecies. Rocky Mountain Black-capped Chickadee.

TYPE: Adult male; No. 10031, Univ. Utah Mus. Zool.; near Merkley Park, 5500 feet, Ashley Canyon, 10 miles north Vernal, Uintah County, Utah; September 4, 1949; collected by William H. Behle, No. 3427.

SUBSPECIFIC CHARACTERS: Distinguished from surrounding races as follows: 1) from *P. a. nevadensis* by having a buffier brown, less grayish dorsum; also a buffier color to the rump, sides and flanks; 2) from *P. a. fortuitous* by smaller size; dorsum lighter, rump buffier so that the two areas are differently colored whereas in *fortuitous* the rump and back are of similar color; white edgings of rectrices and remiges wider and lighter in *garrinus;* 3) from *P. a. septentrionalis* by a browner dorsum without the gray tone.

MEASUREMENTS: Ten males: wing, 70.6–64.3 (68.6) mm.; tail, 69.8–61.5 (66.7); total culmen, 11.2–9.3 (9.9). Ten females: wing, 76.7–63.4 (67.7) mm.; tail, 70.0–63.1 (65.6); total culmen, 11.0–9.0 (9.8). On the basis of this small sample in comparison with the figures of Duvall (*op. cit.*) it does not appear that the size characters of this population differ from those of *P. a. nevadensis* or *P. a. septentrionalis.*

GEOGRAPHIC RANGE: Breeds in eastern Idaho, southwestern and central southern Montana, central and western Wyoming, central and western Colorado, northern New Mexico, eastern Utah. Probably resident for most part but some examples wander in winter outside of breeding range.

SPECIMENS EXAMINED: Of *P. a. garrinus*—IDAHO: Custer County: Lemhi (Sept.). Lake County: Paris (Sept.). WYOMING: Teton County: Teton Pass above Fish Creek, 7000 feet (Sept.); Pacific Creek, 5 miles east of Moran (Sept.). Big Horn County: Greybull (June). Park County: Valley (July). Sublette County: 1 mile north Green River Lakes, 8300 feet (Aug.). MONTANA: Gallatin County: Reese Creek (Aug.); Pass Creek (Aug.); Jefferson River (Sept.); near Hillsdale (Aug.); Madison River (Sept.); Dry Creek (Aug., Sept.); Bozeman (Aug.); Gallatin Station (Sept.). Park County: Livingston (July). Madison County: Ruby Mountains (Aug.). Missoula County: Lolo Creek, 6½ miles west Lolo, 3470 feet (May). Musselshell County: 16 miles south Roundup (Aug.). COLORADO: Jefferson County: Morrison (Oct.); Turkey Creek (Oct.). Adams County: Barr (May); Henderson (Oct.). Douglas County: Castle Rock (Nov.); Littleton (Oct., Feb.). Fremont County: Canon City (Nov.). Pueblo County: Pueblo (Oct.). Clear Creek County: Silver Plume (Sept.). Denver County: Denver (Oct., Nov., Dec.). El Paso County: Palmer Lake (Sept.). Costilla County: Fort Garland (April, Aug., Oct.). Conejos County: Antonito (Mar.), Sanford (Oct.), Conejos River (Sept.). La Plata County: Animas River (June). NEW MEXICO: Santa Fe County: Cieneqvilla (Mar.); Pecos Baldy (Aug.); Santa Fe Mountains (July). San Miguel County: Willis (July); Pecos (Oct.). Rio Arriba County: Horse Lake (Sept.). Taos County: Red River (Aug.); Arroya Seco (Feb.). Chavez County: Hondo Canyon (Jan.). Colfax County: 20 miles southwest Cimarron, 900 feet (Oct.). UTAH: Uintah County: near Merkeley Park, 5500 feet, Ashley Canyon, 10 miles north Vernal (Sept.); Dry Fork Canyon, 6000 feet, 15 miles north Vernal (June). Duchesne County: Stockmore (Oct.). Carbon County: Price (Oct.). Summit County (atypical): Chalk Creek, 5600 feet, 5 miles east Coalville (June); Parley's Park, 6900 feet, 1 mile south Snyderville (July, Sept.). Wasatch County: Cumming's Flat, 7200 feet, 11 miles northeast Heber (June); Snake Creek Canyon, 6000 feet, 3 miles northwest Midway (May).

Of *P. a. nevadensis*—NEVADA: Elko County: Salmon River at Shoshone Creek, 5000 feet (Sept.). IDAHO: Blaine County: Bellevue (Jan., atypical); Cassia County: Howell's Canyon, 8 miles southeast Albion (Dec.); Elba (June). Utah: Boxelder County: George Creek, 6500–7000 feet, Raft River Mountains, 5 miles south Yost (May); Clear Creek, 6500 feet, north slope Raft River Mountains, 5 miles southwest Nafton (May); One Mile Creek, 5200 feet, 1 mile south Stanrod (Aug.); Stanrod 6000 feet (Nov.). Rich County: ½ mile east Monte Cristo, 8400 feet, 41 miles east Ogden (Oct.). Davis County: Mouth Parish Creek Canyon, 5000 feet, 4 miles east Bountiful (April). Summit County: 12 miles east Oakley, 7500 feet (May). Salt Lake County: Mouth Little Cottonwood Canyon, 4400 feet (Mar., Dec.); Bell's Canyon, 4400 feet, 5 miles east Draper (July). Utah County: Four Mile Canyon, Cedar Valley, 5100 feet (Oct.). Piute County: Marysvale (April, atypical). Kane County: Navajo Lake, Cedar Mountain (July, atypical).

Of *P. a. fortuitous*—OREGON: Wallowa County: Enterprise (Feb.); 16 miles south and 3 miles east Lostine, 5500 feet (July). Also John Day River (July). WASHINGTON: Yakima County: Mabton, 900 feet (Jan.); Logycreek Indian Reservation (Nov.). Malheur County: Willow Creek, Ironside (Dec.). Walla Walla County: Prescott (Dec.); south bank Snake River, 1 mile above mouth, 350 feet (May). Whitman County: Pullman (Oct., Nov.). Ferry County: Curlew Lake (Nov.). BRITISH COLUMBIA: Crowsnest (June); Okanagan (Nov.); Clearwater P. O. (May); Cranbrook (April); Beaverbrook Ranch, 22 miles south Kamloops (Jan.); Creston, Kootenay Valley (May). IDAHO: Bonner County: 5 miles west Cocolalla (July); Priest Lake (July); Hunt Creek, Selkirk Mountains (Aug.). Kootenai County:

Tubbs Creek, Coeur d'Alene (Feb.); Lake Coeur d'Alene (Oct.); Fernan Lake, Coeur d'Alene (Mar., May). Latah County: Moscow Mountain, 10 miles northeast Moscow (Oct.); University of Idaho, Moscow (Oct.). Idaho County: 2 miles south southeast Selway Falls, 1900 feet (Sept.).

Of *P. a. septentrionalis*—MONTANA: Custer County: Fort Keogh (Feb., Mar., May, Nov.); 3 miles south Miles City (July). Fergus County: 5 miles northwest Hilger (Aug.); North Fork Flat Willow Creek, 15 miles south Heath, Big Snowy Mountains (Aug.). Cascade County: Fort Shaw (no date). Yellowstone County: Fort Custer (Oct., Dec., Jan.). Chouteau County: Benton (Aug.); Highwood Mountains (Aug.); 5 miles north Wilder on Missouri River (July). Big Horn County: Crow Agency (Aug.); Lodgegrass Creek (May). Phillips County: Darnall's (June); Ruby Creek, Zortman (July); Lismas (June); 2 miles west Leedy (July). Valley County: Glasgow (June). Dawson County: Glendive (May). Rosebud County: Lame Deer (July); Yellowstone River, 5 miles west Forsyth, 2750 feet (June). Powder River County: 4 miles west Fort Howe Ranger Station, 4000 feet (June). Also Big Bend Musselshell River (Aug.). WYOMING: Crook County: Sundance (June). Goshen County: Pine Ridge, 10 miles northeast Fort Laramie (July). COLORADO: Yuma County (atypical): Wray (May, Oct., Nov.); Dry Willow Creek (Aug.). Arapahoe County: Fort Logan (Jan., Mar.). Adams County: Barr (Feb., Mar.); Bennett (Sept., Nov., Jan.). Jefferson County: Wheatland (April); Golden (Mar.); 5 miles west Golden (Jan.). El Paso County: Manitou (Jan.). Pueblo County: Pueblo (Aug., Feb.). Lincoln County: Limon (Jan.). Pitkin County: Aspen (Dec.). Archuleta County: Arboles (April); Pagosa Junction (Mar.). NEW MEXICO: San Juan County: Aztec (Dec.).

DISCUSSION OF DISTRIBUTION AND VARIATION: Specimens from the range of this new race were allocated by Duvall (*op. cit.*) for the most part to *P. a. septentrionalis* which latter subspecies is now restricted to the area of eastern Colorado, portions of Oklahoma, Kansas, North Dakota, and western and northern Montana. Thus the range is confined to the Great Plains area. In contrast, this new race occurs in a mountainous section of North America, having developed in, or at least is presently subjected to, a different environmental situation. Reference to mountain conditions may be a bit misleading, however, for the niche relations of the bird are normally such that these chickadees do not occur in the high mountains. Rather they occur in the ecological situation of the lower canyon floors or lower valleys where a streamside, cottonwood-willow association exists.

Although representatives of this new race are not present from vast areas of the Rocky Mountain region, the specimens in the series, which are at hand, were taken in widely scattered localities and are fairly constant in their appearance. This suggests uniformity of characters within the range as outlined. However, on the fringes of the Rocky Mountains, intergradation occurs with at least two surrounding races, namely *nevadensis*, to the west, and *septentrionalis*, to the east. A discussion of the distribution of the races by states follows:

UTAH.—A large series of specimens from the Raft River Mountains in extreme northwestern Utah represents the race *nevadensis*, the type locality of which is not far distant in northeastern Nevada. Examples from canyon areas along the Wasatch Front, which name applies to the abrupt west-facing escarpment of the Wasatch Mountains in central northern Utah, seem to be even paler than topotypes of *nevadensis*. Immediately to the east of the Wasatch Front, specimens from such locations as near Gorgoza, Snyderville, and Midway show an approach to this new race in being intermediate in color characters. Still farther east at the south base of the Uinta Mountains the specimens are representative of *garrinus*.

Two specimens from southwestern Utah, namely Navajo Lake, Kane County, and Marysvale, Piute County, are closest to *nevadensis*, but not typical. The former, taken July 20, may have been a post-breeding season wanderer from lower elevations. A specimen taken February 9 in Zion Canyon (not examined by the writer) reported by Presnall (Condor, 38: 217, 1936) may be an intergrade or actually represent *nevadensis* as Linsdale (Condor, 40: 37, 1938) suggests.

Two examples from Price, Carbon County, are variable, one being typical *garrinus*, the other lighter, more like *nevadensis*. Duvall (*op. cit.*: 61) speaks of two old specimens from Green River in eastern Utah being very brown and although unlike *nevadensis* he referred them to that race on the basis of their probably having foxed with age and exposure.

Idaho.—Three races are seemingly represented in the area covered by this state. In the southwestern corner the population apparently represents *nevadensis*. At least a series taken at Bellevue, Blaine County, on January 8 shows intergradation between *garrinus* and *nevadensis*, and although not breeding birds they may indicate the general area of blending of the two races. Duvall mentions a specimen from southeastern Idaho that seems to fit *garrinus*. It is from near the mouth of Camas Creek, Mud Lake, Jefferson County, and he reported it as being too buffy (less grayish) and too dark for *nevadensis*. The example from Lemhi in fresh fall plumage clearly represents *garrinus*. Duvall remarked that it was certainly not *nevadensis* or the central Washington bird, *fortuitous*.

Specimens from northern Idaho are darker in coloration and hence represent the race *fortuitous*. A series of 11 birds from nearby Kootenay Valley in British Columbia taken in May probably also represents *fortuitous* although some specimens by their grayness may show *septentrionalis* characters.

Montana.—The type locality of *P. a. septentrionalis* is along the Yellowstone River about 30 miles above its junction with the Missouri River. Apparently this race occupies the northern and eastern part of the state, being replaced by *garrinus* in the southwest and central southern portions. Concerning the chickadees from the *garrinus* part of the state, namely Gallatin County, Duvall (*op. cit.*: 59) wrote, "Birds from Gallatin County, southwestern Montana, are different from almost all other specimens of *septentrionalis* that the writer has seen, being much buffier both above and below, and darker than topotypical examples of *septentrionalis*."

Wyoming.—Examples from the western part of the state are of the race *garrinus* and indications are that those from the eastern edge are *septentrionalis*.

Colorado.—In extreme northeastern Colorado the breeding population seems to be closest to the race *septentrionalis*. Along the east face of the Rocky Mountains the picture of variation is confused. A contributing factor is that, whereas there is a wealth of fall and winter examples at hand, there is a lack of breeding specimens. The fall and winter specimens include some examples having the characters of *garrinus;* others are like *septentrionalis*, while still others are intermediate. This may mean a highly variable and intergrading population or a mixture due to a post-breeding season wandering. In any event I have listed several localities in eastern Colorado for *septentrionalis*, others for *garrinus*. In central and western Colorado the chickadees should be typical of *garrinus*. Specimens from southwestern Colorado taken in the fall represent this new race.

It is interesting to note that Duvall wrote (*op. cit.*: 60): "Specimens in fresh plumage from Colorado are similar to the birds from Gallatin County, Montana, in having a buffy wash to the upper parts, thus averaging more buffy than typical

septentrionalis, and, at the same time, are different from specimens from southern Idaho and Nevada."

New Mexico.—Evidence that *garrinus* extends south into New Mexico is found in Duvall's comments. Speaking of U. S. National Museum specimen number 6776, with no locality given other than just New Mexico, he states (*op. cit.*: 60), that it is a flat skin in very poor condition but "very buffy both above and below, which may be due to 'foxing.' Although taken in New Mexico, it is very different from practically every other specimen with the exception of one from Pecos, New Mexico, and several fresh-plumaged birds from Colorado. Apparently the above-mentioned birds are merely variants of *septentrionalis*." The specimen from Pecos taken October 4, 1883, which I have seen, may indeed have "foxed." At any rate it is distinctive, being much more heavily pigmented and a deeper brown than typical examples of *garrinus*. Duvall further states that, "Specimens from Willis, New Mexico, taken during the breeding season, are somewhat darker than *septentrionalis*, and thus show a trend away from that race, as well as away from *nevadensis*. In addition, other specimens from New Mexico show a departure from the long-tailed form in their smaller size."

There are indications that northern New Mexico may be a meeting ground of races with an involved problem of variation. Specimens in fresh fall plumage from several localities (20 miles southwest Cimmarron; Aztec; Horse Lake; Arroyo Seco; Hondo Canyon) are grayer on the back, seemingly showing an approach to *septentrionalis*.

Arizona.—Black-capped Chickadees are apparently rare in Arizona. The late October specimen reported from Betatakin Canyon by Weatherall (Condor, 39: 86, 1937) and referred to as *nevadensis* by both Linsdale (*op. cit.*: 37) and Duvall (*op. cit.*: 61) is more probably of the race *garrinus*, for Weatherall commented on the conspicuous buff of the sides and flanks.

For comparative material borrowed for this study I am indebted to the following: A. M. Bailey, Denver Museum of Natural History (through A. Lang Bailey); Herbert Friedmann, U. S. National Museum and U. S. Fish and Wildlife Service collections; Thomas R. Howell, Donald R. Dickey Collection, University of California at Los Angeles; Alden H. Miller, Museum of Vertebrate Zoology; and Robert T. Orr, California Academy of Sciences.

University of Utah, Salt Lake City, Utah, July 25, 1950.

PIGMENT VARIATIONS AND THEIR CORRELATES IN BIRDS

BY FANNY LEE AND CLYDE E. KEELER

IN 1941 it was suggested by Keeler and King that certain coat pigmentation genes, in addition to determining melanic variations, produce multiple effects upon morphology, physiology, and behavior in the Norway rat, *Rattus norvegicus*. These conclusions were reached in view of behavior observations upon a captive gray strain of Norway rats and its several mutant—derivative strains, together with an examination of the late Dr. Donaldson's voluminous data on dissection of these same groups of rats. In 1942, Keeler published a detailed comparison of temperament in black (non-agouti) rats and their siblings bearing the gray coat color characteristic of wild Norway rats. The black mutants were found to be tamer than the grays by nature. More recent papers, Keeler (1947) have shown that this phenomenon occurs in numerous species of mammals.

An attempt to apply these findings to birds has yielded several conclusive cases. A study was made by Keeler, Hoffman, and Shearer (1949) upon many specimens of the faded-feather mutation in the Turkey, *Meleagris gallopavo*, and the faded mutants were found to have defective vision, broken or missing feathers, weak bones, and small body size.

A white, blue-eyed, mutant *Rhea americana* (about 6 weeks old) at the Philadelphia Zoo was found to be tame and unafraid of strangers as compared with its timid and excitable brown relatives.

Keeler (unpublished) has compared a pair of albino Collared Doves, *Streptopelia roseogrisea*, with a pair bearing the normal bisque coloration. The albinos have reduced ocular pigment and defective vision. They do not fly well. Their voices are relatively weak, and they are less active than the normals. After two weeks it was possible to hold the albinos on a finger, but the bisque doves would not perch on a finger even after an acquaintance of more than six months. A letter from Finn Salomonsen says that at the Copenhagen Zoo, where both varieties have been kept for many years, the albinos are less active and have weaker voices than the bisque variety.

Word from Dr. Y. Yamashina of Japan indicates that the albino Rice-bird, *Munia*, or more properly, *Lonchura*, has brownish eyes, is less active, and has a weaker voice than normally colored Rice-birds.

Because the above cases are so suggestive, it was decided that a survey of the literature ought to be made to learn whether or not other cases of pigment correlation have been recorded.

Realizing the enormity of the task of combing world ornithological literature, it was decided to limit the survey, with two exceptions, to English language articles that could be located in the libraries of Chicago. Thus, this study is merely a sample of the literature and is, therefore, incomplete. Strong's 'Bibliography of Birds' (1936–1946) was used as the source of the references.

The descriptions of mutant birds in this restricted literature turn out to be extremely unfortunate for our purposes in that most of them were written from observations made upon dead birds or their stuffed skins, and the behavior of most individuals was not noted. Often eye-color was not recorded, and there is much confusion between piebalds and complete albinism. For this reason an accurate classification of the references is impossible, but the most satisfactory categories seem to be: (1) pink-eyed albinism; (2) "pure" albinism (which undoubtedly includes many piebalds); (3) "pale"; (4) white spotted; (5) "mottled" in several shades; and (6) miscellaneous. The results of this survey of literature have been classified according to these categories in Table 1.

In Table 1 it will be noted that the 172 recorded pigment variations have no predilection for particular orders of birds but are scattered from the lowest to the highest in evolutionary development. It will also be observed that in those groups such as the Anatidae, Phasianidae, Columbidae, Corvidae, Icteridae, Fringillidae, Turdidae, and others, mutations have been recorded that fall into most of the categories that we have employed.

Again, it should be pointed out that these types of mutations appear in general to correspond to those most commonly found in mammals, namely, true pink-eyed albinism, dilutions (especially similar to pink-eyed buff), and various types of piebald. Less common in mammals are the other types of coat color mutation which would correspond to "miscellaneous" of our classification. In Table 1 these cases are seen to be rare.

In the literature one encounters in a few cases casual mention of the correlated characteristics of individual mutants. Unfortunately, the mutants were usually shot, and hence behavior observations over a period of time were not made.

Of these cases, seven ought to be noted. The details of these mutants are given in Table 2.

No matter how deficient they may be, these observations suggest that some of the mutants of ornithological literature exhibit morphological, physiological, and behavioristic changes quite in line with those found in mutant mammals and birds following extended observa-

TABLE I

RECORDED INSTANCES OF PLUMAGE MUTATIONS IN BIRDS

Miscellaneous	*Mottled*	*White-spotted*	*"Pale"*	*"Pure" albino*	*Pink-eyed albinism*	Family of bird involved
		1				Gaviidae (Loons)
1	1					Laridae (Gulls, Terns)
				1		Sulidae (Gannets)
	2	1				Phalacrocoracidae (Cormorants)
	1	†4†	4	3	1*	Anatidae (Ducks, etc.), † = 2 mutants, * = 5 mutants)
1				1		Gruidae (Cranes)
		1	1			Rallidae (Rails, Coots)
	1	1	3	1		Scolopacidae (Snipes, etc.)
		1				Charadriidae (Plovers), Aphrizidae (Surf birds)
		1†				Haematopodidae (Oyster catchers) († = 2 mutants)
	1		1			Tetraonidae (Grouse)
	1					Meleagridae (Turkeys)
	2	1	3†	3		Phasianidae (Pheasants) († = 2 mutants)
	†2*	2		2		Columbidae (Pigeons) († = 5 mutants, * = 12 mutants)
	1			2		Cathartidae (New World Vultures)
	1			3		Buteonidae (Hawks)
		1	2			Falconidae (Falcons)
	1	1				Strigidae (true owls)
1						Psittacidae (Parrots)
1			2			Picidae (Woodpeckers)
2				1		Trochilidae (Hummingbirds)
				1		Tyrannidae (Tyrant flycatchers)
				2		Alaudidae (Larks)
	2	4	7	5†	1	Corvidae (Crows) († = 2 mutants)
		1	3		1	Sturnidae (Starlings)
	††9*‡	5*	1	1	2†	Icteridae (Blackbirds, Orioles) († = 4 mutants, * = 40% of flock, †† = 4 mutants, s = several mutants)
4*	5	†12†	3	2†	2†	Fringillidae (Finches) († = 2 mutants, * = 3 mutants)
	1		1	1*	2	Hirundinidae (Swallows) (s = several mutants)
	1					Vireonidae (Vireos)
1		2		1	1	Mniotiltidae (Warblers)
1				1		Motacillidae (Wagtails)
	2					Mimidae (Mimic thrushes)
		2	1			Troglodytidae (Wrens)
1		1†				Paridae (Titmice) († = 2 mutants)
			1			Sylviidae (Kinglets and Gnatcatchers)
1	†3††	2	2		1	Turdidae (Thrushes) († = 2 mutants, †† = 3 mutants)
14	37	44	35	31	11	SUBTOTALS
					172	TOTAL

tions. The birds may be noticeably large or small; they may be wilder or tamer than normal; they may have reduced vocal powers.

In the literature there are several references that merit special consideration.

Darwin (1890) described a physiological correlation between feather coloring and degree of development of down at hatching in pigeons. He says: "Mr. Tegetmeier has informed me of a curious and inexplicable case of correlation, namely, that young pigeons of all breeds which when mature become white, yellow, silver (i. e., extremely pale blue), or dun colored, are born almost naked; whereas pigeons of other colours are born well clothed with down."

TABLE 2

Bird	*Color*	*Morphology, physiology, behavior,*
Coot (*Oidemia* sp. ?)	dirty white; underparts of wings bleached brown; eyes black	head of flock
Vulture (*Cathartes* sp.)	white	small, but leader of flock
Hawk (*Buteo* sp.)	partial albino	showed fear of other hawks
Red-tailed Hawk (*Buteo i. borealis*)	albino	extra large and robust; 25 years old
Swamp Sparrow (*Melospiza georgiana*)	male; white except one dark feather	very fat; very shy
Blue Titmouse (*Parus caeruleus*)	head, neck, wings, and tail French gray; under parts canary yellow; eyes pink	size small; semi-tame
Thrush (species ?)	red breast	wilder bird; more reserved vocal powers

Maw (1935) detected in chickens what may turn out to be larger body size associated with silver feather color or slow feathering, the genes for which two characters reside on the sex chromosome. The differences were not considered statistically significant, and because the silver feather color and slow feathering genes entered the cross on the same chromosome, it was concluded that there also resides on the same chromosome a gene for large body size. But because the silver color gene and the slow feathering genes were not separated and studied further, it is impossible to say whether the size effect noted was due to a linked gene or was a pleiotropic effect of either the silver color gene or the slow feathering gene.

After 18 years in captivity a strain of Mallard Ducks described by Hunter (1939) produced a light-feathered, generally-recessive mutation. Light Mallards were interbred. Of 42 eggs set: four were infertile; seven died too early to determine feather color; 27 light Mallards died between the 23rd day and hatching time; four light

Mallards hatched but died within a few days. It would appear that a semi-lethal weakness of embryo and duckling is associated with the light gene. A back-cross was made of (Light Mallard by Fawn Indian Runner) by Light Mallard. A total of 59 eggs were set: eight were infertile; seven died too early to determine color; 24 of Normal Mallard color and 15 of Light Mallard color died between the 23rd day and hatching time; two Normals and three Light Mallards hatched and died within a few days. As compared with this high mortality among ducks bearing the Light gene in simplex or duplex, a cross of Light Mallard to Fawn Indian Runner is instructive. Twenty-nine eggs were set: three were infertile; five died too early to determine the color; ten Blue-gray blends died between the 23rd day and hatching time; ten Blue-gray blends and one Light Mallard were hatched.

These experiments were not carried far enough to decide whether the semi-lethal effect is due to the Light gene itself or to another gene linked on the same chromosome.

Probably the most satisfactory case in the literature, in which mutations among wild birds have been observed, is that reported by McIlhenny (1940). This observer watched 12 nests of Mockingbirds—all belonging to a male and his two successive mates. The male and his first mate were apparently heterozygous for albinism. Of their 43 offspring hatched, 18 were albinos and 25 were normal. "The albinos were deficient in sight, weak in voice, and not as active on the wing as their normal nest-mates. All normal young except two survived. No albinos survived."

But lest the reader should get the idea that all pigment variations are associated with weakness we should mention the description of Hachisuka's dark mutant pheasant (Legendre '1941): "The bird is large and robust. As a game bird, the Dark Pheasant presents itself as flying high and fast. Its weight is greater than that of ordinary pheasants."

Although the specific physical, physiological, and behavioristic defects of mutant birds are seldom recorded, ornithologists have a definite feeling about the matter that is well summed up in a series of articles by Legendre (1935):

"In nature, cases of albinism are often observed and collections contain numerous specimens. These cases are perhaps more frequent than we suppose, because one must think that these birds, too easily seen, are quickly eliminated by their enemies, all the more because they represent specimens of reduced vitality, since albinism implies degeneration."

Again this author says: "But the breeders are not content with modifying the coloration of the animals that we have just enumerated. The transformation has been more complete, and among others varieties have been created by alterations carried out upon the size, bodily form, or a part of the body, and the voice." Here Legendre recognized changes in morphology and behavior, but does not specifically associate them with pigment alterations.

Of particular interest is Legendre's description of the albino mutant of the Collared Dove, *Streptopelia roseogrisea*,—"We may note that aside from the Canary and the Undulated Parakeet, there have been domesticated few cage birds. It is always necessary to mention the Collared Turtledove, raised since long, but which scarcely interests the amateurs, because it always remains with its single white variety. This white variety was much studied in the past because of the gentleness of the bird. It was the symbol of faithfulness; and the gift of a white Turtledove to a lady much resembled a betrothal.—Occasionally there have been found in the same nest one youngster with gray plumage beside a white one."

CONCLUSION

A sample of ornithological literature and recent observations demonstrate that certain pigment variations in birds possess correlates in the modification of morphology, physiology, and behavior, as shown previously to be the case in mammals.

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Georgia State College for Women, Milledgeville, Georgia, July 11, 1950.

NOTES ON EASTERN CHINESE BIRDS

BY WILLIAM B. DAVIS AND BRYAN P. GLASS

DURING World War II, Glass was stationed in China in 1944 and 1945 and had the opportunity of preserving 79 specimens of birds which were later donated to the Texas Cooperative Wildlife Collection.

Collecting was done at the following localities: Hengyang, Hunan, 26° 55′ N., 112° 25′ E.; Chihkiang, Hunan, 27° 15′ N., 110° 05′ E.; Linchuan (also listed as Shenkiutsi on some maps), Anhwei, 35° 02′ N., 115° 21′ E.; and Litsi, Anhwei, a small town about 50 miles south of Linchuan.

Hengyang is in the valley of the Siang River, in the heart of the "Rice Bowl." Most of the collecting was done in the vicinity of the military airfield, a place where flat ricefields alternate with rather steep-sided hills that are usually covered with a dense tangle of brush, tall grass and trees. Around all of the farms there are groves of trees, bamboo thickets and ponds, and in many places there are graveyards grown up to brush and trees. The autumn is dry in this region, but winter and spring are normally wet. In summer it is hot with many thunderstorms.

Chihkiang, about 100 miles west of Hengyang, is situated on the eastern edge of the great southwestern plateau of China. The elevation of the airfield is about 2,700 feet, but nearby mountains rise to 6,000 feet. The whole region is hilly, with much brush, and the only cultivated areas are in the narrow river valley and the tributary valleys which are even narrower. The weather in autumn and winter in this region is moist and foggy as a rule.

Linchuan and Litsi are both situated on the vast plain of north China commonly called the Honan Plain. Both of these towns are only a few miles from the eastern border of Honan Province. The soil there is deep, the climate dry except in midsummer, and the landscape flat and dusty; there are no hills. The land is almost entirely under cultivation, either in wheat, which is the winter and spring crop, or in other cereals during the summer. The only relief from the monotony of the landscape is in the groves of trees that are found around every village and cemetery and in the infrequent streams that cut deeply below the general level of the plain, a feature that made it possible to stalk ducks on this tremendous flat area.

A few observations were made in the summer of 1944 at the town of Lingling about 100 miles southwest of Hengyang, but circumstances prevented collecting of specimens there. There are also a few sight records for Kweilin, Kwangsi Province, and for Kunming, Yunnan.

We wish to recognize Dr. Herbert Friedmann and Mr. H. G. Deignan of the U. S. National Museum for assistance in identifying the collection and to express our appreciation of their courtesy in permitting Davis to make direct comparisons with Asiatic specimens in the museum. Insofar as possible we have followed Peters' 'Check-list of Birds of the World' in matters of taxonomy. La Touche's 'A Handbook of the Birds of Eastern China' (issued in parts, 1925–1934) has been helpful in dealing with species not yet treated by Peters.

Ardea cinerea jouyi Clark, GRAY HERON.—One adult female, Linchuan, April 7, 1945. Taken from a nesting colony of approximately 12 pairs. Common resident.

Ardeola bacchus (Bonaparte), POND HERON.—One immature individual (sex not determined), Linchuan, May 24, 1945. Summer visitant.

Anser fabalis Swinhoe, BEAN GOOSE.—At Linchuan these were seen almost daily in winter. One collected, but later destroyed by house cat.

Casarca ferruginea (Pallas), RUDDY SHELDRAKE.—Seen once at Chihkiang in late fall, and several times near Linchuan in January, February, and March. None collected because the bird has goose-like habit of alighting in open wheatfields rather than on rivers. Only rarely seen on water.

Anas platyrhynchos platyrhynchos Linnaeus, MALLARD.—One adult male, Linchuan, February 15, 1945. Common in winter.

Anas crecca crecca Linnaeus, GREEN-WINGED TEAL.—One adult male, Linchuan, February 26, 1945. Common in winter.

Anas querquedula Linnaeus, GARGANEY TEAL.—One adult male, Linchuan, May 14, 1946. Observed only in spring.

Mareca penelope (Linnaeus), WIDGEON.—One adult male, Linchuan, May 2, 1945. Winter visitant and spring migrant.

Nyroca baeri (Radde), EASTERN WHITE-EYE DUCK.—One adult male, Linchuan, May 4, 1945. Winter visitant in this region.

Mergellus albellus (Linnaeus), SMEW.—One immature male, Linchuan, February 21, 1945. Winter visitant in this region.

Milvus lineatus lineatus (J. E. Gray), BLACK-EARED KITE.—One adult female, Hengyang, January 19, 1944. Commonest bird of prey in South China, at least in regions visited, where it is resident. These birds frequent villages and act as scavengers.

Accipiter nisus nisosimilis (Tickell), SPARROW HAWK.—One adult male, Litsi, January 15, 1945; one adult female, Linchuan, January 25, 1945. Winter visitant.

Aquila nipalensis nipalensis (Hodgson), ASIATIC EAGLE.—One adult male, Chihkiang, October 20, 1944. For about two weeks in October these large birds were seen every day in vicinity of Chihkiang. None seen at other seasons.

Falco tinnunculus japonensis Ticehurst, KESTREL.—One adult female, Chihkiang, November 8, 1944. Winter visitant.

Falco amurensis Radde, RED-LEGGED FALCON.—One immature male, Chihkiang, November 6, 1944. Probably migrant in this vicinity.

Microsarcops cinereus (Blyth), GRAY-HEADED LAPWING.—One adult female, Linchuan, March 30, 1945. Spring migrant.

Charadrius alexandrinus alexandrinus Linnaeus, KENTISH PLOVER.—Two adult males, Hengyang, February 26, 1944. Winter visitant.

Charadrius placidus Gray, LONG-BILLED RINGED PLOVER.—One adult female, Hengyang, February 26, 1944. Probably resident.

Tringa ochrophus Linnaeus, GREEN SANDPIPER.—One adult male, Chihkiang, October 17, 1944. Seen on several occasions in fall and winter—always solitary.

Erolia temminckii (Leisler), TEMMINCK'S STINT.—One adult female, Linchuan, April 27, 1945. Winter visitant.

Erolia alpina sakhalina (Vieillot), DUNLIN or RED-BACKED SANDPIPER.—One female, Hengyang, February 20, 1944. Winter visitant.

Streptopelia orientalis orientalis (Latham), TURTLE DOVE.—One adult male, Linchuan, April 20, 1945. Summer visitant and commonest dove on Honan Plain during summer. Nesting pairs may be identified by peculiar towering ascent in flight and the fixed-wing, gliding descent to vicinity of nest.

Streptopelia tranquebarica humilis (Temminck), RUDDY TURTLE DOVE.—One adult male, Linchuan, May 18, 1945. Summer visitant.

Streptopelia chinensis chinensis (Scopoli), SPOTTED-NECK DOVE.—One adult male, Hengyang, January 30, 1944. Resident species at Hengyang and was seen at all other places where collecting was done. At Linchuan it was only dove seen during colder months, whereas the other two species, *S. t. humilis* and *S. o. orientalis*, were summer visitants only. At Chihkiang this species was very abundant.

Glaucidium cuculoides whitelyi (Blyth), BARRED OWLET.—One adult male, Chihkiang, December 10, 1944. Apparently resident.

Asio otus otus (Linnaeus), LONG-EARED OWL.—One adult male, Litsi, January 16, 1945. A colony of approximately 15 was found living in cedar trees surrounding small village near Litsi. They roosted among branches, both in groves and in solitary trees. Winter visitant.

Alcedo atthis bengalensis Gmelin, LITTLE BLUE KINGFISHER.—One adult male, Hengyang, February 7, 1944. This bird is common throughout rice-growing regions of China. It was often seen at Hengyang where it is resident.

Ceryle lugubris (*guttulata* Stejneger ?), PIED KINGFISHER.—Although no specimens were taken, this kingfisher was seen on numerous occasions at Hengyang in winter, and a hole in a bank overhanging a farm pond was occupied by these birds. Also observed along Siang River at Lingling in summer of 1944. Resident.

Upupa epops saturata Lönnberg, HOOPOE.—One adult male, Linchuan, March 21, 1945. Migrant in this part of China. Observed in previous years at Peiping, Hopei, where it was apparently nesting.

Dendrocopos canicapillus scintilliceps (Swinhoe), SPARK-HEADED WOODPECKER.—One male, Hengyang, March 23, 1944; one male, Linchuan, January 25, 1945. The most frequently observed woodpecker in areas visited. Resident.

Alauda arvensis intermedia Swinhoe, SKYLARK.—One female, Litsi, January 16, 1945. This specimen is somewhat paler than the average of *intermedia*. Birds were present in small flocks wherever wind had swept ground clear of snow. Winter visita nt.

Hirundo rustica gutturalis Scopoli, BARN SWALLOW.—One adult male, Linchuan, March 31, 1945. These birds often build mud nests on rafters inside native houses, utilizing doors and windows for entrance and exit. Summer visitant in this region.

Dicrurus macrocercus cathoecus Swinhoe, BLACK DRONGO.—One adult female, Chihkiang, October 17, 1944. Also observed nesting at Linchuan in April, 1945.

Oriolus sinensis indicus Jerdon, BLACK-NAPED ORIOLE.—One adult male, Linchuan, May 21, 1945. Summer visitant. Also seen at: Lingling in August, 1944, when young were off nest, but not willing to fly; Hengyang in May and June, 1944; and Chihkiang in September, 1944.

Coloeus dauuricus dauuricus Pallas, COLLARED JACKDAW.—One adult male, Linchuan, February 21, 1945. Winter visitant. These birds were also common at Kunming, where they are found in same flocks with the all-black form. Both color phases were seen at Linchuan, but in small numbers and only in winter and spring.

Pica pica sericea Gould, MAGPIE.—One adult female, Hengyang, February 7, 1944. The Black-billed Magpie is second in abundance to House Sparrow, *Passer montanus*, in all areas of China visited. Resident and thrives in areas of dense human population.

Urocissa erythrorhyncha erythrorhyncha Boddaert, RED-BILLED MAGPIE.—One adult male, Chihkiang, December 8, 1944. Resident.

Cyanopica cyana swinhoei Hartert, AZURE-WINGED MAGPIE.—One female, Linchuan, January 25, 1945. Resident.

Corvus torquatus Lesson, COLLARED CROW.—One adult male, Hengyang, February 20, 1944. Commonest crow at Hengyang, far outnumbering Jungle Crow, *Corvus coronoides*, none of which was taken. The latter was more abundant at Chihkiang where few Collared Crows were seen.

Corvus corone orientalis Eversmann, CARRION CROW.—One female, Linchuan, February 9, 1945. Often seen feeding in flocks composed of both crows and rooks. Do not seem to have habit of living in large flocks close to human habitations as do the latter. Winter visitant.

Corvus frugilegus pastinator Gould, ROOK.—One male, Litsi, January 16, 1945. Most villages in central China have flocks of rooks that nest in trees and scavenge in fields near by. Resident.

Suthora webbiana webbiana Gray, CROW-TIT.—One male, Hengyang, February 7, 1944. Common from February to May near Hengyang. Also seen at Chihkiang from October to December. Travel in large winter flocks and frequent bushy thickets where they are difficult to see, even though numerous.

Parus major artatus Thayer and Bangs, GREAT TIT.—One male, Chihkiang, October 29, 1944. Also common at Linchuan. Resident.

Parus cinereus commixtus Swinhoe, GRAY TIT.—Common in vicinity of Hengyang and Chihkiang, but no specimens collected. Resident.

Aegithaliscus concinnus concinnus (Gould), RED-HEADED TIT.—One adult female, Hengyang, February 26, 1944. Encountered only twice, in winter, in dense brush and grass of an uncultivated hillside near Hengyang in February and near Chihkiang in November, 1944.

Sitta europaea sinensis Verreaux, EUROPEAN NUTHATCH.—Seen only once—in hostel yard at Lingling in August, 1944. No specimens collected.

Alcippe dubia genesteri Oustalet, WHITE-THROATED TIT-BABBLER.—One female, Chihkiang, October 29, 1944. This specimen constitutes a considerable northward extension of range and a new record for eastern China.

Garrulax perspicillatus perspicillatus Gmelin, BLACK-FACED LAUGHING THRUSH.—One male, Litsi, January 15; one female, Linchuan, February 3. Also seen at Hengyang in February and at Chihkiang in November, 1944. Resident.

Spizixos semitorques semitorques Swinhoe, COLLARED BULBUL.—One adult female, Hengyang, March 23, 1944. Encountered only twice, in March and April. Birds were in association with the Chinese Bulbul, *Pycnonotus sinensis*, in bamboo thicket near Hengyang.

Pycnonotus sinensis sinensis Gmelin, CHINESE BULBUL.—One male, Hengyang, January 15, 1944. Encountered in fall and winter at Hengyang and in summer at Lingling and Kweilin.

Turdus merula mandarinus (Bonaparte), BLACK THRUSH.—One male, Hengyang, January 30, 1944. Resident at Hengyang. Habits are similar to those of American Robin except that in winter they were not observed in flocks.

Turdus eunomus Temminck, SPOTTED THRUSH.—One male, Linchuan, April 27, 1945. Winter visitant.

Turdus naumanni naumanni Temminck, RED-TAILED THRUSH.—One female, Litsi, January 19, 1945; one female, Linchuan, February 7, 1945. Apparently winter visitant in central and southern China.

Saxicola torquata stejnegeri (Parrot), COLLARED STONECHAT.—One adult male, Hengyang, February 7, 1944. Seemingly winter visitant, although La Touche ('A Handbook of the Birds of Eastern China,' 1925: 154) records it as migrant in Lower Yangtse Valley.

Phoenicurus auroreus auroreus (Pallas), DAURIAN REDSTART.—One male, Hengyang, February 20, 1944; one male, Chihkiang, October 29, 1944; one female, Linchuan, March 28, 1945. Common winter visitant at above localities.

Rhyacornis fuliginosa fuliginosa (Vigors), WATER REDSTART.—One adult male, Chihkiang, November 10, 1944. Apparently resident in area visited.

Prinia polychroa parumstriata (David and Oustalet), HILL WARBLER.—One male, Hengyang, January 16, 1944. Seemingly a new record for eastern China—not reported by La Touche ('Handbook of the Birds of Eastern China,' 1925–27).

Terpsiphone paradisi incei (Gould), PARADISE FLYCATCHER.—One adult female, Hengyang, April 24, 1944. Summer visitant at Hengyang, arriving about middle of April. A nest was found in tree in hostel yard in May. Both brown and white color phases of males were seen near Hengyang, the white ones more frequently, possibly because of their conspicuousness. Also were nesting at Chenhsien (50 miles south of Hengyang). We have sight records for Lingling (August) and Linchuan (April).

Anthus spinoletta japonicus Temminck and Schlegel, WATER PIPIT.—One female, Linchuan, March 23, 1945. Winter visitant.

Motacilla alba leucopsis Gould, WHITE-FACED WAGTAIL.—One male, Chihkiang, October 17, 1944. Also observed on numerous occasions at Hengyang during winter and spring.

Lanius bucephalus Temminck and Schlegel, BULL-HEADED SHRIKE.—One female, Hengyang, February 7, 1944. Winter visitant.

Lanius schach schach Linnaeus, RED-BACKED SHRIKE.—One female, Hengyang, January 19, 1944. Resident.

Acridotheres cristatellus cristatellus (Linnaeus), CRESTED MYNA.—One male, Hengyang, January 19, 1944. Present in large, noisy flocks at Hengyang and Kweilin in fall and winter; seen at Lingling in summer, but not in flocks—prized cage bird among Chinese.

Sturnus cineraceus Temminck, GRAY STARLING.—One male, Chihkiang, December 10, 1944; one female, Litsi, January 18, 1945. Always seen in flocks of 30 or more.

Sturnus sericeus Gmelin, SILKY STARLING.—One male, Hengyang, February 23, 1944. Seen only twice, both times at Hengyang, in large, closely organized flocks so that the temporary impression was of extreme abundance. Frequented tall trees around farm houses. Apparently winter visitant at this locality.

Zosterops japonica simplex Swinhoe, JAPANESE SILVER-EYE.—One female, at Hengyang, a cage bird. Observed in wild at Lingling in August where a flock frequented trees in hostel yard. Probably resident.

Passer montanus taivanensis Hartert, TREE SPARROW.—One male, Hengyang, January 11, 1944. Common resident at all localities visited, occurring in flocks in winter.

Coccothraustes coccothraustes japonicus Temminck and Schlegel, JAPANESE HAWFINCH.—One female, Linchuan, January 28, 1945. Observed occasionally in January and February. Winter visitant.

Eophona migratoria sowerbyi Riley, BLACK-TAILED HAWFINCH.—One female, Hengyang, January 19, 1944. Winter visitant at Hengyang, in small flocks around farm houses. Prized by Chinese as pet.

Chloris sinica sinica (Linnaeus), CHINESE GREEN FINCH.—One adult female, Hengyang, January 19, 1944. Resident. Nesting at Hengyang in April.

Emberiza aureola ornata Shulpin, YELLOW-BREASTED BUNTING.—One female, Chihkiang, October 17, 1944; in flock of about 25. Seemingly migrant.

Emberiza pusilla Pallas, LITTLE BUNTING.—One male, Hengyang, January 19, 1944; one female, Chihkiang, October 24, 1944. Winter visitant.

Emberiza rustica Pallas, RUSTIC BUNTING.—One male, Linchuan, February 18, 1945. Winter visitant.

Emberiza cioides castaneiceps Moore, MEADOW BUNTING.—One male, Chihkiang, October 17, 1944. Sight records for Hengyang, June, 1944, and Kweilin, July, 1944. Resident.

Fringilla montifringilla Linnaeus, BRAMBLING.—One male, Litsi, January 19, 1945. Winter visitant in central China.

Department Wildlife Management, Texas A. and M. College, College Station, Texas, and Department Zoology, Oklahoma A. and M. College, April 11, 1950.

THE SIXTY-EIGHTH STATED MEETING OF THE AMERICAN ORNITHOLOGISTS' UNION

BY OLIN SEWALL PETTINGILL, JR., SECRETARY

THE first meeting of the Union in Minnesota and the sixth meeting west of Chicago was held in Minneapolis and St. Paul, October 8 to 13, 1950, at the invitation of the Minnesota Ornithologists' Union and the University of Minnesota. Headquarters were in the St. Paul Hotel, St. Paul, where the business sessions took place; public sessions were held in the Minnesota Museum of Natural History, on the campus of the University of Minnesota in Minneapolis.

BUSINESS SESSIONS

Business sessions were as follows: (1) First Session of the Council, Sunday, October 8, 8:15 to 11:10 p. m. Number in attendance, 20. (2) Second Session of the Council, Monday, October 9, 9:05 to 11:30 a. m. Number in attendance, 20. (3) Third Session of the Council, Monday, 2:10 to 3:30 p. m. Number in attendance, 18. (4) First Meeting of the Fellows, Monday, 4:00 to 5:40 p. m. Number in attendance, 20. (5) Meeting of the Fellows and Members, Monday, 8:15 p. m. to Tuesday, October 10, 1:15 a. m. Number in attendance, 56 (Fellows, 27; Members, 29). (6) Fourth Session of the Council, Thursday, October 12, 1:45 to 2:25 p. m. Number in attendance, 16. (7) Second Meeting of the Fellows, Thursday, 2:25 to 2:30 p. m. Number in attendance, 18.

Reports of Officers. The Secretary reported that the total membership of the Union was 2,959 as of October 9, 1950. Membership by classes was as follows: Fellows, 58; Fellow Emeritus, 1; Honorary Fellows, 13; Corresponding Fellows, 69; Members, 157; Associates, 2,661. Since the last meeting, 310 persons had been proposed for Associate membership, their election at this meeting bringing the total membership to 3,269, the largest in the Union's history. The Secretary had received death notices of the following members:

Louis Bennett Bishop, Fellow, April 3, 1950, at Pasadena, Calif.
Henry Boardman Conover, Fellow, May 5, 1950, at Chicago, Ill.
Percy Roycroft Lowe, Honorary Fellow, August 18, 1948, in England.
Cecil Boden Kloss, Corresponding Fellow, August 19, 1949, in England.
Arthur Herbert Evelyn Mattingly, Corresponding Fellow, October 1, 1950, in Australia.
Charles William Gustave Eifrig, Member, November 1, 1949, at Orlando, Fla.
Harold Michener, Member, October 14, 1949, at Pasadena, Calif.
Charles Knapp Carpenter, Honorary Life Associate, December 24, 1948, at Baileyville, Ill.

Fred Monroe Dille, Honorary Life Associate, January 24, 1950, at Nogales, Ariz.
Jacob Bates Abbott, Associate, July 14, 1950, at Brattleboro, Vt.
Rudolph Bennitt, Associate, February 3, 1950, at Columbia, Mo.
Charlotte Bogardus, Associate, August 2, 1949, at St. Petersburg, Fla.
Henry Ward Carriger, Associate, October 1, 1949, at Red Bluff, Calif.
Joseph Larke Floyd, Associate, February 5, 1950, at Canton, Ohio.
Frederick Arnold Hemphill, Associate, March 1, 1949, at Elizabeth, N. J.
Clyde Metzger Kepner, Life Associate, at Pikesville, Md.
Philip Patrick Malley, Associate, April 7, 1950, on train between Lancaster and Bethlehem, Pa.
William White McCall, Associate, September 16, 1949, at Haverford, Pa.
Robert Baird McClain, Life Associate, November 15, 1946, at Monrovia, Calif.
Leslie Loraine Pontius, Associate, February, 23, 1950, at Circleville, Ohio.
Clifford Hayes Pangburn, Associate, December 16, 1949, at St. Augustine, Fla.
Katie Myra Roads, Life Associate, October 3, 1949, at Hillsboro, Ohio.
Mrs. Frederick William Shaw, Associate, July 18, 1949, at Richmond, Va.
Fannie Adelle Stebbins, Associate, July 1, 1949, at Chicopee, Mass.
Mrs. Henry G. Vaughan, Associate, October 6, 1949, at South Berwick, Me.

The Treasurer gave his report which is published in this number of 'The Auk.'

Dr. Harvey I. Fisher, Editor of 'The Auk,' reported that during 1950 his office had received manuscripts for 146 articles, 440 general notes, and 51 obituaries. Manuscripts for 21 articles and 46 general notes, enough for the next two numbers, were edited and ready for the printer. He discussed some of the difficulties involved in covering recent literature and indicated that in the coming year he would solicit help for the purpose of giving more thorough coverage. At his request, the Council authorized the President to appoint an Illustrations Committee to assist the Editor in locating and selecting suitable material for colored and black and white plates.

Reports of Committees. The Treasurer reported that the Endowment Committee under the Chairmanship of Mrs. W. W. Naumburg had obtained $535.00 from life memberships and $461.00 from donations.

The report of the Special Canadian Committee, given by Mr. Hoyes Lloyd, Chairman, showed total receipts since September 15, 1949, of $665.67. Total assests in Canada, as of September 15, 1950, were $4,398.13.

Dr. Alexander Wetmore, Chairman of the Committee on Classification and Nomenclature of North American Birds, reported that the Committee has been working on the revision of ranges for the last half of the Check-List. The material on Alaudidae, Mimidae, Turdidae, Laniidae, Sturnidae, Vireonidae, and Coerebidae is now complete.

The material on all other families, except the Tyrannidae, is complete to the Parulidae. Sixty-five cases covering changes in name or status, new forms, and revival of old forms have been considered by the Committee. Nineteen cases received favorable action and were published in 'The Auk' for July, 1950. Mr. E. M. Reilly continued in the employment of the Committee, assembling records from the files of the Fish and Wildlife Service for use in preparing range material. This expense has been met through a grant from the Smithsonian Institution, the expenditures to date having been $7,167.50. An additional grant of $3,090.00 has been made recently to cover the continuation of this work to the end of September, 1951, making a total of $10,257.50. The cost of typing, mimeographing, mailing of range material to the collaborators, and the handling of all correspondence has also been carried by the Smithsonian.

Mr. C. K. Nichols, the Editor of the 'Ten-year Index to The Auk,' reported by letter that all indexing would be completed by the first of the year. The new index will show very few changes in form from its predecessors.

The Committee on Research, according to Dr. Albert Wolfson, Chairman, is making favorable progress with its book on recent research. By the end of one more year the manuscript should be ready and the publication of the book will be undertaken.

Last December the Committee on Education, under the direction of Dr. William H. Behle, Chairman, distributed application blanks, accompanied by explanatory letters soliciting candidates for student membership awards, to 65 ornithologists in all sections of the country. The point was stressed that "the student membership is an honor awarded, not a competition won," and the sponsors were urged to make careful selection of the candidates for the award. Twenty applications were received by the closing date. Since funds were available for 20 student memberships, all applications were filled. Each student was notified in mid-January and received the January and subsequent issues of 'The Auk.' (For the names of the recipients, see the April, 1950, number of 'The Auk.')

The Award of the Brewster Medal. The 1950 Brewster Medal was awarded, by action of the Council, to Dr. Alexander F. Skutch, of Costa Rica, for his series of studies on the life histories of tropical birds in the Western Hemisphere.

Next Stated Meeting. Fellows and Members, meeting jointly, accepted the invitation of the Province of Quebec Society for the Protection of Birds to hold the Sixty-ninth Stated Meeting in Montreal on October 7 to 12, 1951.

Amendments of the By-Laws. Four amendments of the By-Laws were given final approval. The first deletes "United States, Canada, or Newfoundland" from both Sections 2 and 6 of Article I and substitutes "United States or Canada" in both Sections. The second removes the limit on the number of Fellows which may be elected in any one year. Formerly no more than five Fellows could be elected, even if there were six or more vacancies. The third permits Associates to be appointed to committees of the Union. The fourth raises by one dollar the dues of all classes of members and the subscription price of 'The Auk.'

Eleven amendments were proposed and referred to the Fellows for final action in 1951. (For the most recent edition of the By-Laws, see the April, 1950, number of 'The Auk.') The proposed changes follow: (1) The first sentence in Section 1 of Article II would read: "The Officers of the Union shall be a President, two Vice-Presidents, a Secretary, a Treasurer, and nine elective Councilors." (2) Section 2 of Article II would read: "The President or, in case of his absence or inability to act, one of the Vice-Presidents shall preside at the meetings of the Union and of the Council, shall appoint all Committees except such as are otherwise provided for, and shall be *ex officio* a member of all Committees." (3) The first sentence in Section 5 of Article III would read: "Stated Meetings of the Council shall be held immediately preceding each Stated Meeting of the Union and at least once again during the Stated Meeting." (4) The first sentence in Section 2 of Article IV would read: "All Officers, except elective members of the Council, shall be elected annually." (5) The third paragraph in Section 3 of Article IV would be deleted, while the first two paragraphs in the same section would be revised to read:

> "Election of Officers are to be held as follows: Nominations for each officer shall be made by means of an informal ballot, the result of which shall be announced by the Secretary; after which the first formal elective ballot on the names proposed in the nominating ballot shall be taken; and the candidate receiving a majority of the ballots cast shall be declared elected.
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> "In the ballot for elective members of the Council, each voter may write on one ballot as many names as there are Councilors to be elected, viz., three on the first ballot and on each subsequent ballot as many names as there are vacancies yet to be filled; and those candidates who receive the votes of a majority of the Fellows and Members voting shall be declared elected, provided that the the number of persons receiving such majority does not exceed the

number of vacancies to be filled, in which case the candidates receiving the highest majorities shall be declared elected."

(6) In Section 6 of Article IV, the second sentence in the second paragraph would read: "Any candidate who, on each of three successive ballots, fails to receive the votes of half the Fellows and Members present, shall cease to be a candidate during the remainder of that Stated Meeting." (7) The second paragraph in Section 8 of Article IV would be deleted, because it does not deal with the subject of Article IV and because it is subsumed by Section 2 of Article VI. (8) Section 11 of Article IV would read: "Any member may be expelled from the Union on satisfactory evidence that said member is an improper person to be connected with the Union, or has made improper use of his membership; such expulsion shall be by a two-thirds vote by ballot of the Fellows and Members present at a Stated Meeting, three months' previous notice of such proposed action having been given by the Secretary to each Fellow and Member and to the member accused." (9) Section 2 of Article VI would read: "Communications on Ornithology may be read at the scientific meetings of the Union by any member, or for him by any other member, by previous arrangement with the Secretary." (10) In the first sentence in Section 3 of Article VII, the word "devices" would read "devises." (11) Article VIII would be revised to read:

"Notice of proposed additions and amendments to the By-Laws must be in writing, signed by two Fellows, and read at a session of the Fellows in a Stated Meeting of the Union. Such additions and amendments shall be referred to the Council, which may amend them, and the Council shall report thereon to the Fellows at the same Stated Meeting. This report shall then be considered by the Fellows for amendment; and any proposition approved by the Fellows for adoption shall be published in 'The Auk' in the Proceedings of the Union and be voted upon by the Fellows at the next Stated Meeting. If it then receives two-thirds of the votes cast, it shall be declared adopted.

"Absent Fellows may send their vote on pending changes in the By-Laws to the Secretary in writing, and such votes shall be counted as if the Fellows were present."

ELECTION OF OFFICERS

The officers elected for 1951 are as follows: *President*, Josselyn Van Tyne; *Vice-Presidents*, Alden H. Miller and Ludlow Griscom; *Secretary*, Olin Sewall Pettingill, Jr.; *Treasurer*, R. Allyn Moser. *Elective Members of the Council:* Frank A. Pitelka (term to expire in 1951), W. J. Breckenridge, George H. Lowery, Jr., and L. L. Snyder.

The Council elected Harvey I. Fisher, *Editor* of 'The Auk'; Frederick V. Hebard (Chairman), R. M. de Schauensee, and Phillips B. Street, *Investing Trustees.*

ELECTION OF FELLOWS, MEMBERS, AND ASSOCIATES

FELLOWS—7

Walter John Breckenridge, Minneapolis, Minnesota.
Maurice Graham Brooks, Morgantown, West Virginia.
Harvey Irvin Fisher, Urbana, Illinois.
William Rowan, Edmonton, Alberta.
Aretas Andrews Saunders, Canaan, Connecticut.
Alexander Sprunt, Jr., Charleston, South Carolina
Winsor Marrett Tyler, Brighton, Massachusetts.

CORRESPONDING FELLOWS—2

François Haverschmidt, Paramaribo, Surinam, Dutch Guiana.
Helmuth O. Wagner, Mexico City, Mexico.

MEMBERS—25

Anders Harold Anderson, Tucson, Arizona.
Rollin Harold Baker, Lawrence, Kansas.
William John Beecher, Chicago, Illinois.
Charles Henry Blake, Lincoln, Massachusetts.
Ben Barry Coffey, Jr., Memphis, Tennessee.
James Fred Denton, Augusta, Georgia.
Alexander Dawes DuBois, Excelsior, Minnesota.
Mary Marilla Erickson, Santa Barbara, California.
Ernest Thomas Gilliard, New York City.
Horace Groskin, Ardmore, Pennsylvania.
William Hampton Marshall, St. Paul, Minnesota.
Harold Ford Mayfield, Toledo, Ohio.
Gale Wendell Monson, Parker, Arizona.
Karl Plath, Oak Park, Illinois.
Fred John Pierce, Winthrop, Iowa.
Hustace Hubbard Poor, Yonkers, New York.
Kenneth Racey, Vancouver, British Columbia.
William Frederick Rapp, Jr., Crete, Nebraska.
William Austin Squires, St. John, New Brunswick.
Walter Penn Taylor, Stillwater, Oklahoma.
Melvin Alvah Traylor, Jr., Chicago, Illinois.
Mrs. Ruth Harris Thomas, Morrilton, Arkansas.
Arthur Baldwin Williams, Cleveland, Ohio.
Cecil Sloan Williams, Washington, D. C.
Angus Munn Woodbury, Salt Lake City, Utah.

ASSOCIATES—310

ATTENDANCE

Registration at the meeting showed an attendance of 137, composed of 27 Fellows, 36 Members, and 74 Associates. Represented were 26 states, the District of Columbia, two provinces of Canada, Puerto Rico, and Cuba. Registration also showed an attendance of 133 guests, bringing the total registration to 270.

FELLOWS, MEMBERS, AND ASSOCIATES PRESENT

PATRONS:—Hoyes Lloyd, Mrs. Dayton Stoner.

FELLOWS:—Arthur A. Allen, Dean Amadon, W. J. Breckenridge, Maurice Brooks, James P. Chapin, H. G. Deignan, John T. Emlen, Jr., Harvey I. Fisher, Ira N. Gabrielson, S. Charles Kendeigh, Frederick C. Lincoln, Hoyes Lloyd, George H. Lowery, Jr., Ernst Mayr, Alden H. Miller, Robert Cushman Murphy, Mrs. Margaret M. Nice, James L. Peters, Olin Sewall Pettingill, Jr., A. L. Rand, Aretas A. Saunders, Alexander Sprunt, Jr., Herbert L. Stoddard, R. M. Strong, Josselyn Van Tyne, Alexander Wetmore, John T. Zimmer.

MEMBERS:—Mrs. Elsa G. Allen, Robert P. Allen, John H. Baker, Allan D. Cruickshank, David E. Davis, Alexander D. DuBois, Albert F. Ganier, E. Thomas Gilliard, W. Earl Godfrey, Stephen S. Gregory, Jr., Owen J. Gromme, Frederick N. Hamerstrom, Jr., Harry W. Hann, Joseph J. Hickey, Joseph C. Howell, Peter Paul Kellogg, Mrs. Junea W. Kelly, Seth H. Low, William H. Marshall, Harold Mayfield, Harold D. Mitchell, Burt L. Monroe, R. Allyn Moser, Allan R. Phillips, Richard H. Pough, William F. Rapp, Jr., Chandler S. Robbins, James Savage, A. W. Schorger, Robert W. Storer, James T. Tanner, Milton B. Trautman, Lawrence H. Walkinshaw, Laidlaw O. Williams, Leonard Wing, Albert Wolfson.

ASSOCIATES:

Arizona, 1—Lyndon L. Hargrave, Benson.

California, 1—Carl Koford, Berkeley.

Illinois, 4—Karl E. Bartel, Blue Island; Harold C. Hanson, Urbana; Don Smith Prentice, Rockford; Mrs. Hermon D. Smith, Chicago.

Iowa, 3—Henry Birkeland, Roland; Fred T. Hall, Davenport; Zell C. Lee, Sioux City.

Michigan, 3—Mrs. Edith K. Frey, Jackson; Robert M. Mengel, Ann Arbor; Mrs. Josselyn Van Tyne, Ann Arbor.

Minnesota, 19—Mrs. Dorothy Beard, Mound; James R. Beer, St. Paul; Sam M. Cox, Duluth; Whitney Eastman, Minneapolis; Arnold B. Erickson, Excelsior; Constance Everett, Waseca; Harvey L. Gunderson, Minneapolis; Byron E. Harrell, St. Paul; Pershing B. Hofslund, Duluth; Severena C. Holmberg, Minneapolis; William Kilgore, Minneapolis; Forrest B. Lee, St. Paul; William H. Longley, Kasson; Mrs. Mary L. Lupient, Minneapolis; Mrs. G. R. Magney, Minneapolis; Clayton G. Rudd, Minneapolis; Orwin A. Rustad, Northfield; E. D. Swedenborg, Minneapolis; Dwain W. Warner, Minneapolis.

Nebraska, 1—Mrs. Jane M. Moser, Omaha.

New Jersey, 2—Mrs. Herbert E. Carnes, Tenafly; Edward L. Chalif, Short Hills.

New York, 13—Mrs. Albert R. Brand, New York City; Stephen W. Eaton, Allegany; Mrs. C. N. Edge, New York City; Lawrence I. Grinnell, Ithaca; M. Max Hensley, Ithaca; Kenneth D. Morrison, New York City; Mrs. Grace E. Barstow Murphy, New York City; Edward L. Seeber, Kenmore; Robert Stein, New Hyde Park; Mrs. Dayton Stoner, Albany; Carll Tucker, Mt. Kisco; Mrs. Carll Tucker, Mt. Kisco; Edward C. Ulrich, Buffalo.

North Dakota, 3—J. Frank Cassel, Fargo; Robert T. Gammell, Kenmare; O. A. Stevens, Fargo.

Ontario, 3—William W. H. Gunn, Toronto; Mrs. Wilmot Lloyd, Ottawa; Mrs. Doris Huestis Speirs, Pickering.

Pennsylvania, 2—Frederick V. Hebard, Philadelphia; William Ely Roberts, Lansdowne.

Quebec, 1—W. S. Hart, Montreal.

South Dakota, 2—Herman F. Chapman, Sioux Falls; J. Scott Findley, Sioux Falls.
Texas, 1—Mrs. Anne Hinshaw Wing, College Station.
Washington, 1—Ernest S. Booth, College Place.
Wisconsin, 12—Nicholas E. Collias, Madison; Warren P. Dettmann, Milwaukee; Carl P. Frister, Milwaukee; Frederick Greeley, Madison; Clarence S. Jung, Milwaukee; Barnard David Kaiman, Milwaukee; Robert A. McCabe, Madison; Margarette E. Morse, Viroqua; Oliver S. Owen, Ripon; Frederick A. Potts, Waupaca; Mrs. Walter E. Rogers, Appleton; Harold C. Wilson, Ephraim.
Cuba, 1—Abelardo Moreno, Havana.
Puerto Rico, 1—Virgilio Biaggi, Jr., Mayagüez.

PUBLIC SESSIONS

Six public sessions were held in the Minnesota Museum of Natural History. Four of these sessions were concerned with the reading of papers. The session on Wednesday afternoon was devoted to a symposium; the session on Thursday afternoon was occupied mainly by a showing of motion pictures. An outline of the program is presented below. Titles marked with an asterisk were illustrated by lantern slides; those with two asterisks, by motion pictures.

TUESDAY MORNING SESSION

Welcome by MALCOM M. WILLEY, Vice-President, Academic Administration of the University of Minnesota.

Response on Behalf of The American Ornithologists' Union.

Report on the Business Meetings; Announcements of the Results of Elections and of the Brewster Memorial Award.

Announcements from the Local Committee on Arrangements.

*The Tenth International Ornithological Congress at Upsala, Sweden. ALEXANDER WETMORE, Smithsonian Institution, Washington, D. C.; ROBERT CUSHMAN MURPHY, American Museum of Natural History, New York City; ARTHUR A. ALLEN, Laboratory of Ornithology, Cornell University, Ithaca, New York.

Efforts to Restore the Numbers of the Three Rarest North American Bird Species. JOHN H. BAKER, National Audubon Society, New York City.

Ornithologists and Conservation. RICHARD H. POUGH, American Museum of Natural History, New York City.

TUESDAY AFTERNOON SESSION

*Evolution of Parental Care in Birds. S. CHARLES KENDEIGH, University of Illinois, Champaign.

*The Probability of Survival of Nestlings. DAVID E. DAVIS, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland.

*Song, Courtship, and Nesting Behavior in a Hand-raised Meadowlark. MARGARET M. NICE, Chicago, Illinois.

*Behavior and Reproduction of the Congo Peacock. JAMES P. CHAPIN, American Museum of Natural History, New York City.

*A Three-year Nesting Study of Wood Ducks. W. J. BRECKENRIDGE, Minnesota Museum of Natural History, University of Minnesota, Minneapolis.

*Apparatus for the Study of Bird Eggs, with Notes on Criteria of Age in Developing Eggs. HAROLD C. HANSON, Illinois Natural History Survey, Urbana.

Roosting Activities of the Puerto Rican Honey-creeper. VIRGILIO BIAGGI, JR. University of Puerto Rico, Mayagüez.

*Feeding Habits of the California Condor. CARL KOFORD, University of California Museum of Vertebrate Zoology, Berkeley.

Educational Values of Bird Banding. O. A. STEVENS, North Dakota Agricultural College, Fargo.

WEDNESDAY MORNING SESSION

Recording and Preserving the Sounds of Nature (with phonograph records). P. P. KELLOGG, Laboratory of Ornithology, Cornell University, Ithaca, New York.

*Recording European Bird Songs (with phonograph records). ARTHUR A. ALLEN, Laboratory of Ornithology, Cornell University, Ithaca, New York.

Notes on the Songs of a Hermit Thrush in the Yukon. ANNE HINSHAW WING, College Station, Texas.

What Is a Bird Song? ARETAS A. SAUNDERS, Canaan, Connecticut.

*The Temporal Pattern of Nocturnal Migration. GEORGE H. LOWERY, JR., Louisiana State University, Baton Rouge.

*A Study of the Seasonal Changes in Gonad-stimulating Activity of the Pituitary Glands of Ring-necked Pheasants. FREDERICK GREELEY and ROLAND K. MEYER, University of Wisconsin, Madison.

Effect of Day Length on Gonadal Growth in White-throated and White-crowned Sparrows. ALBERT WOLFSON, Northwestern University, Evanston, Illinois.

Preliminary Information on the Breeding Cycles of Birds in Colombia, South America. ALDEN H. MILLER, University of California Museum of Vertebrate Zoology, Berkeley.

*The Calendar of "Wideawake Fair." JAMES P. CHAPIN, American Museum of Natural History, New York City.

WEDNESDAY AFTERNOON SESSION

SYMPOSIUM

Social Behavior in Birds

JOHN T. EMLEN, JR., Chairman

Development of Social Bonds. NICHOLAS E. COLLIAS, University of Wisconsin, Madison.

Social Responses and Gregariousness. JOHN T. EMLEN, JR., University of Wisconsin, Madison.

Social Behavior and Reproductive Potentials. DAVID E. DAVIS, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland.

Social Behavior and Survival. F. FRASER DARLING, Newbury, Berkshire, Great Britain.

THURSDAY MORNING SESSION

The Measurement of Breeding Bird Populations by Means of the Roadside Census. JOSEPH C. HOWELL, University of Tennessee, Knoxville.

The Allegheny Mountains as a Barrier to Bird Movement. MAURICE BROOKS, West Virginia University, Morgantown.

*Distribution of the Chickadees in the Southern Appalachians. JAMES T. TANNER, University of Tennessee, Knoxville.

*The Distribution of the Breeding Birds of an Elm-Maple-Ash Swamp in Central New York. OLIVER S. OWEN, Ripon College, Ripon, Wisconsin.

*Ecological Distribution of the Passerine Birds on New Caledonia. DWAIN W. WARNER, University of Minnesota, Minneapolis.

Variation in Winter Bird Population Distribution. LEONARD W. WING, Agricultural and Mechanical College of Texas, College Station.

*Parulids Wintering in Cuba. STEPHEN W. EATON, St. Bonaventure University, St. Bonaventure, New York.

*An Attempt to Determine Statistically the Breeding Grounds of the Various Wintering Populations of the Painted Bunting. ROBERT W. STORER, University of Michigan Museum of Zoology, Ann Arbor.

*Some Distributional Aspects of a Mexican Bird Population. BYRON E. HARRELL, University of Minnesota, Minneapolis.

The Classification of Birds by Families. JOSSELYN VAN TYNE, University of Michigan Museum of Zoology, Ann Arbor.

The Meaning of Polymorphism in Birds. ERNST MAYR, American Museum of Natural History, New York City.

*Some Effects of Three Insecticides on the Ring-necked Pheasant. WILLIAM B. JACKSON, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland.

*John Abbot and His Drawings of American Birds. ELSA G. ALLEN, Laboratory of Ornithology, Cornell University, Ithaca, New York.

THURSDAY AFTERNOON SESSION

**Life History of the Baird's Cormorant in Sound and Color. ERNEST S. BOOTH, Walla Walla College, College Place, Washington.

**One Hundred and Eighty Degrees around the Gulf. LAWRENCE I. GRINNELL, Ithaca, New York.

**Collecting in the Central Highlands of New Guinea. E. THOMAS GILLIARD, American Museum of Natural History, New York City.

**Birds of an Arctic Day, A Pictorial Account of the 1949 Perry River Expedition. Photography by Peter Scott of London, England. Presented by HAROLD C. HANSON, an Expedition Member, Illinois Natural History Survey, Urbana.

OTHER EVENTS

On Monday evening, a dinner for the Fellows and the Council was given by the Local Committee in the Capitol Room of the St. Paul Hotel.

Two hundred and twenty-two members and guests attended the Annual Dinner on Tuesday evening in the Main Ballroom of the Coffman Memorial Union. The Twin Cities Swedish Society Dance Group, dressed in appropriate costumes, entertained with a series of folk dances. Dr. Dwain W. Warner, under the pseudonym of Olaf Olafson, delivered a lecture in Norwegian dialect on a bird expedition to "Shangri-La." The evening's levity was further increased by the appearance of 'The Auklet' with 32 pages.

On Thursday evening, about 270 members and guests gathered in the auditorium of the Museum for the dedication of the Thomas Sadler Roberts Plaque. President Murphy spoke briefly, paying trib-

ute to Dr. Roberts' contributions to ornithology and giving an account of several amusing incidents in Dr. Roberts' life. Parts of a motion picture entitled "Superior North Shore in Winter" were shown by Dr. W. J. Breckenridge. At the conclusion of the program, members and guests visited the Center for Continuation Study where they viewed a display of bird prints from the collections of Dr. and Mrs. Dwight E. Minnich.

Field trips to several of the outstanding bird observation areas in Minneapolis and nearby points were taken by 78 persons on Friday morning.

RESOLUTIONS

At the public session on Thursday afternoon, the following resolutions were passed:

Resolved, that we express the very grateful appreciation of the American Ornithologists' Union to the Minnesota Ornithologists' Union and to the members of the University of Minnesota for their kind hospitality and for their tireless efforts in arranging for our Sixty-eighth Stated Meeting.

Resolved, that we extend our thanks to Milton D. Thompson, Mrs. I. A. Lupient, Amy Chambers, J. F. Clements, Whitney Eastman, Harvey L. Gunderson, R. A. Kortmann, Donald K. Lewis, Mrs. G. R. Magney, Theodora Melone, John Jarosz, Olin Sewall Pettingill, Jr., Dwain W. Warner, Vernon Whipple, Mrs. M. M. Willey, and W. J. Breckenridge, Chairman, of the Local Committee on Arrangements, for their excellent work in planning and carrying through this first Minnesota meeting of the American Ornithologists' Union.

THE AMERICAN ORNITHOLOGISTS' UNION

TREASURER'S REPORT, FISCAL YEAR ENDING SEPTEMBER 15, 1950

INCOME TO ACTIVE FUND ACCOUNT

Dues		
Fellows	$ 173.25	
Members	445.75	
Associates	7,244.37	
		$ 7,863.37
Subscriptions		1,009.35
Sale of Publications		993.68
From Authors for Reprints		544.85
From Advertisements		53.50
From Educational Fund		59.02
From Bird Protection Fund (loaned, 1949)		7.09

From Brewster Fund (loaned, 1949)		$ 18.26
Interest from:		
General Endowment Fund		1,094.75
Ruthven Deane Fund		287.86
Contributions to Active Publications Fund (compensating for insufficient income from dues)		2,343.50
		14,275.23
Less returned checks		15.00
Total Income		$14,260.23

SPECIAL FUNDS

Brewster Award Fund		
Interest from Investments	$ 448.21	
Balance from 1949	1.03	
Expenses for Medals (1949, 1950)		86.26
To Investing Trustees (added to principal)		375.00
Borrowed from General Cash Fund	12.02	
	$ 461.26	$ 461.26
Educational Endowment Fund		
Interest from Investments	85.88	
To Active Fund (borrowed, 1949)		26.86
To Active Fund, 20 Student Members		59.02
	$ 85.88	$ 85.88
Bird Protection Endowment Fund		
Interest from Investments	$ 59.10	
To Active Fund (borrowed, 1949)		7.09
To Active Fund (for reprints of the Committee Report)		14.17
Amount in Cash Account for use of Committee	$ 37.84	
Endowment Fund		
Collected during 1948, to be invested	592.25	
Collected since September 15, 1949		
Life Members	535.00	
Donations	461.00	
To Investing Trustees		$ 1,100.00
Collected during 1948, still to be invested	488.25	
Special Fund for Publication of Fifth Edition of Check-List of North American Birds, on deposit in Savings Department of United States National Bank, Omaha	500.00	

DISBURSEMENTS

Manufacture and Distribution of 'The Auk'	$ 9,977.14
Deficit, end September 30, 1949	95.16
Reprints (July, 1949 to July, 1950, incl.)	770.31
Editor's Expenses (Sept. 1, 1949, to Nov. 1, 1950)	572.83
Secretary's Expenses	48.46
Treasurer's Expenses	520.65

Membership Committee	$ 108.57
Expenses 1949 meeting not paid 1949	164.13
Expenses 1950 meeting paid to Oct. 1, 1950	274.06
Printing (cards, notices, stationery, etc.)	642.55
Mailing	452.60
Purchase of back issues of 'The Auk'	148.64
Bank Charges and Refunds	42.71
Telephone and Telegraph	12.70
Zoological Society of London (contribution to Zoological Record)	25.00
Loaned Brewster Fund	12.02
To Endowment Fund, change from Member to Life Member	3.00
To Investing Trustees, for General Endowment Fund	104.00
Total Expended	$13,974.53
Total Income Active Fund	14,260.23
Less Expended	13,974.53
Balance in Active Account	285.70
Balance in Endowment Account	488.25
Balance in Bird Protection Account	37.84
Amount in Checking Account	$ 811.79

R. Allyn Moser, *Treasurer.*

OFFICERS, TRUSTEES, AND COMMITTEES OF THE AMERICAN ORNITHOLOGISTS' UNION

	Expiration of Term
Josselyn Van Tyne, *President*	1951
Alden H. Miller, *First Vice-President*	1951
Ludlow Griscom, *Second Vice-President*	1951
Olin Sewall Pettingill, Jr., *Secretary*	1951
R. Allyn Moser, *Treasurer*	1951
Harvey I. Fisher, *Editor of 'The Auk'*	1951

Elective Members of the Council

Frank A. Pitelka	1951
Austin L. Rand	1951
John T. Zimmer	1951
Ira N. Gabrielson	1952
Ernst Mayr	1952
A. W. Schorger	1952
W. J. Breckenridge	1953
George H. Lowery, Jr.	1953
L. L. Snyder	1953
Jean M. Linsdale, *Cooper Ornithological Club Representative*	1951
Burt L. Monroe, *Wilson Ornithological Club Representative*	1951

CHARLES F. BATCHELDER, 1905–8
ARTHUR CLEVELAND BENT, 1935–37
JAMES P. CHAPIN, 1940–42
HERBERT FRIEDMANN, 1937–39
HOYES LLOYD, 1945–48
ROBERT CUSHMAN MURPHY, 1948–50
JAMES L. PETERS, 1942–45
ALEXANDER WETMORE, 1926–29
} *Ex-Presidents*

INVESTING TRUSTEES

FREDERICK V. HEBARD, *Chairman* 1951
R. M. DE SCHAUENSEE 1951
PHILLIPS B. STREET 1951

COMMITTEES

COMMITTEE ON FINANCE. R. Allyn Moser, *Chairman*. Stephen S. Gregory, Jr., Burt L. Monroe, Olin Sewall Pettingill, Jr., J. Van Tyne.

COMMITTEE ON ENDOWMENT. Elsie M. B. Naumburg, *Chairman*. Herbert W. Brandt, Jean Delacour, Francis H. Kortright, R. Allyn Moser, Herbert L. Stoddard.

SPECIAL CANADIAN COMMITTEE. Hoyes Lloyd, *Chairman*. J. A. Munro, L. L. Snyder.

COMMITTEE ON PUBLICATIONS. The Editor of 'The Auk,' *Chairman*. The President, the Secretary, the Treasurer, the Editor of 'The Ten-year Index to The Auk' (Charles K. Nichols), Alden H. Miller.

COMMITTEE ON COMMUNICATIONS. Olin Sewall Pettingill, Jr., *Chairman*. John T. Emlen, Jr., Albert Wolfson.

EDITORIAL COMMITTEE. Harvey I. Fisher, *Chairman*. John T. Emlen, Jr., S. Charles Kendeigh, Robert W. Storer.

COMMITTEE ON THE BREWSTER MEMORIAL AWARD. Alden H. Miller, *Chairman*. David E. Davis, Harvey I. Fisher, A. Starker Leopold, Ernst Mayr.

COMMITTEE ON BIOGRAPHY. A. W. Schorger, *Chairman*. Jean Delacour, Donald S. Farner, J. J. Hickey, Hildegarde Howard, T. S. Palmer, J. Murray Speirs.

COMMITTEE ON THE NOMINATION OF FELLOWS AND MEMBERS. John W. Aldrich, *Chairman*. L. L. Snyder, Frank A. Pitelka.

COMMITTEE ON THE NOMINATION OF ASSOCIATES. Leonard Wing, *Chairman*. (Membership to be announced later.)

COMMITTEE ON CLASSIFICATION AND NOMENCLATURE OF NORTH AMERICAN BIRDS. Alexander Wetmore, *Chairman*. Herbert Friedmann, *Vice-Chairman*. Frederick C. Lincoln, Alden H. Miller, James L. Peters, Josselyn Van Tyne, John T. Zimmer.

COMMITTEE ON BIRD PROTECTION. Richard H. Pough, *Chairman*. (Membership to be announced later.)

COMMITTEE ON RESEARCH. Albert Wolfson, *Chairman*. Donald S. Farner, Herbert Friedmann, S. Charles Kendeigh, Ernst Mayr, Alden H. Miller, Margaret M. Nice.

COMMITTEE ON EDUCATION. William H. Behle, *Chairman*. Ian McT. Cowan, John T. Emlen, Jr., Joseph C. Howell, Charles G. Sibley.

LOCAL COMMITTEE ON ARRANGEMENTS FOR THE SIXTY-NINTH STATED MEETING. G. H. Montgomery, Jr., *Chairman*. W. S. Hart, *Vice-Chairman*. Miss Ruth Abbott, *Secretary*. W. H. Rawlings, *Treasurer*. W. R. B. Bertram, J. D. Cleghorn, J. A. Decarie, M. J. Dunbar, G. Harper Hall, Louis Lemieux, J. J. Rousseau, David Scott, L. McI. Terrill, Mrs. L. McI. Terrill.

GENERAL NOTES

A New Race of the Cuckoo, *Chalcites lucidus*, from the New Hebrides Islands.—Recent examination of specimens from southern Melanesia in the American Museum of Natural History has shown that the Shining Cuckoo inhabiting the northern New Hebrides and Banks Islands represents a well defined race, hitherto undescribed.

In his review of this species Mayr (Amer. Mus. Nov., No. 520: 1–9, 1932) presented in detail the characters and distribution of the three races, *lucidus*, *plagosus* and *layardi*, recognized at that time and described an additional one, *harterti*, from Rennell and Bellona islands. Since that date an excellent series of specimens was secured for the American Museum by L. Macmillan on New Caledonia and all three of the Loyalty Islands (Mayr, Amer. Mus. Nov., No. 1057: 1–3, 1940).

All measurements and color comparisons included in the present paper have been made in as nearly the same manner as possible to those in Mayr's review of 1932. Bill measurements are from the nostril; culmen is from the base. I am indebted to Dr. Ernst Mayr and Dr. Dean Amadon for helpful suggestions during the preparation of this paper.

Chalcites lucidus aeneus new subspecies

TYPE: No. 213509, Amer. Mus. Nat. Hist.; adult male (testes "swelling"); Malekula Island; August 8, 1926; collected by Rollo H. Beck of the Whitney South Seas Expedition.

SUBSPECIFIC CHARACTERS: ADULT MALE—Larger than *layardi* and *harterti* in all measurements; smaller than *lucidus* and *plagosus* in wing length but bill larger. Closest to *layardi* but bill broader and longer; upper parts much darker; forehead and crown dark purple-bronze and faintly glossy; nape and fore-back deep purple-bronze and very glossy; rest of upper parts including lower back, scapulars, tail, wing-coverts and secondaries (outer webs) greenish-bronze and very glossy; sides of neck and breast deeper cinnamon, the cinnamon extending across entire breast as pale wash in many specimens; bars of underparts broader and deeper bronze (almost entirely replacing the green of *layardi*). Tail pattern: differs from *layardi* by further replacement of white spots with russet on fifth (outer), fourth, third, and second rectrices; on the fourth, white is in most specimens restricted to small spot near tip on inner web and does not touch shaft; black areas smaller and lighter; on the third and second, russet bands are larger and slightly darker. Very different from *harterti;* above much darker, bars of underparts considerably broader.

CHARACTERS OF FEMALE: In the two females examined (Vanua Lava, Espiritu Santo) sexual dimorphism is not discernible with certainty.

RANGE: Northern New Hebrides Islands (Epi, Ambrym, Malekula, Espiritu Santo), Banks Islands (Gaua, Vanua Lava, Ara Is.), and (race ?) Santa Cruz Islands (Utupua).

Birds from the Banks Group average slightly less purple-bronze on the wing and tail than New Hebrides birds, and the barring on the undersides of two of the former is darker. The only specimen from the Santa Cruz Islands, a female from Utupua, is scarcely or not at all distinguishable from females from Lifu except that the barring of the underparts is paler, lacking iridescence almost entirely.

The subspecies *layardi*, which is restricted to New Caledonia and the Loyalty Islands (Uvea, Lifu, Maré) at least during the breeding season, in addition to being

MEASUREMENTS IN MILLIMETERS

		Wing	Tail	Bill	Culmen
aeneus					
New Hebrides	8 males	98.6 (96–103)	71.3 (69–73)	12.8[1] (12.1–13.5)	20.0[1] (19.0–20.9)
	1 female	101.0	72.0	14.0	21.3
Banks Island	4 males	97.7 (97–100)	69.0 (67–71)	13.0 (12.5–13.5)	20.5 (19.6–21.5)
	1 female	—	68.0	12.0	19.4
Santa Cruz Island	1 female	95.0	67.0	12.5	20.0
layardi					
New Caledonia, Loyalty Island	14 males	95.8 (89–99)	71.1[2] (68–73)	11.5 (11–13)	18.6 (17.5–20)
	8 females	96.3 (94–98)	69.9[1] (68–72.5)	11.8 (11–13)	18.5[1] (18–19.5)

[1] seven specimens [2] ten specimens

Width of bill at nostril 5.4–6.4 (5.96) millimeters in *aeneus*, as against 5.0–6.1 (5.69) in *layardi*.

smaller than *aeneus*, is greenish rather than bronze in appearance both above and below, especially on the back and upper tail and is only slightly glossy. The bars of the underparts are narrower and the cinnamon of the sides of neck and breast is paler and more restricted, never extending across the breast. Birds from Uvea, Maré, and New Caledonia are similar to each other, but the Lifu specimens examined (2 males, 4 females), especially the females, tend toward New Hebrides birds in coloration, but are closer to *layardi*. Although these Lifu females appear slightly more intensely colored (darker) than other *layardi* females examined, perhaps this is because they are in very fresh plumage, apparently having recently completed the prenuptial molt. These Lifu birds were taken July 23, 25, and August 9; only a female taken on the last date (ovary very much enlarged) shows any signs of molt, and this by the presence of a few partly sheathed feathers on the chin. May and June birds from Uvea and New Caledonia are in body molt and November birds from New Caledonia show considerable wear. Since in this series females from Lifu may not be comparable in color to females from the other islands of this group, the true picture of the differences between females from Lifu and elsewhere can not be stated with assurance at this time. Sexual dimorphism in this race appears to me to be restricted to the Lifu population in which females are slightly darker than males.—DWAIN W. WARNER, *Museum Natural History, University Minnesota, Minneapolis, Minnesota.*

Western Meadowlark, *Sturnella neglecta*, in New York State.—On April 18, 1948, a Western Meadowlark was observed singing in an apple tree just south of the North Hamlin Road, County of Monroe, about 1 mile south of Lake Ontario. The song which attracted members of the Genesee Ornithological Society (J. Brown, J. Taylor, A. Bussewitz, and A. Klonick) was bubbling and flute-like, occasionally interspersed with staccato call notes and definitely not the slurred song of *S. magna*. The bird continued its melodious song for at least two hours.

The bird was secured and is now in the collection of the Rochester Museum of Arts and Sciences. This appears to be the first verified record of this species for New York State.—ALLAN S. KLONICK, *828 Grosvenor Rd., Rochester 10, N. Y.*

Red-wing, *Agelaius phoeniceus*, Anting.—On June 8, 1949, at 5:00 p. m., I observed an adult male Red-wing anting on a lawn in Vilas Park, Madison, Wisconsin. Observations were made at 30 feet with the aid of 6-x binoculars.

This bird was anting when first noticed and continued rapidly and steadily for seven minutes, picking up ants at least 20 times in this period. The behavior described by Ivor (Auk, 58: 415, 1941) applies in part to the behavior observed in this instance, particularly holding the only partly spread wing out from the body, wrist forward and raised, tips of the primaries forward and touching the ground, and the tail brought forward. The Red-wing apparently rested on his tarsi, using the spread tail for support.

The rapidity of the anting made it difficult to see exactly what was being done with the ants. At any rate, ants were picked up and "placed under the primaries." There did not appear to be any attempt to slide them along the feathers as has been noted by some observers. The anting was noticeably alternate, first on one wing and then on the other, using a new ant each time.

It might be of interest to note here that the attitude of a Red-wing, while preening under his wings following a bath, closely resembles the attitude in anting. Such preening seems to be directed toward the under-wing coverts or the base of the primaries. This same movement is also used to smooth and dry the head feathers.

A live ant found in the short, dry grass where the bird had been anting was identified by Dr. M. R. Smith of the U. S. Department of Agriculture as *Formica fusca* var. *subsericea* Say. On August 1, 1950, I observed two adult males anting vigorously in the same spot on the lawn as described above. They were observed in continuous anting behavior for ten minutes after they were first sighted.—ROBERT NERO, *Dept. Zoology, Univ. of Wisconsin, Madison, Wisconsin.*

Bullock's and Baltimore Orioles, *Icterus bullockii* and *galbula*, in Southwest Georgia.—Two young males of Bullock's Oriole have been collected by the writer in Grady County, southwest Georgia. The first one, with a striking black pencil mark down the center of the throat, was taken February 5, 1947, as a cold northwest gale was blowing. The other, with a suggestion of the black throat-marking present, but obscured by whitish tippings to the feathers, was collected November 22, 1948. These, as far as known, constitute the first records of this species for Georgia, and the southeast, east of Louisiana. Perhaps the presence of the Bullock's Oriole in the region is not surprising when the southeastward movement of many western birds is considered; the *time* is, at first thought. In this connection should be mentioned the female specimen of this species that was picked up dead in southern Louisiana on February 5, 1939 (Tabor, Auk, 57: 257, 1940).

The time of appearance of three specimens of the Baltimore Oriole in Grady County was surprising then, for the species had not been observed in the immediate region during 25 years of active field work, though a sharp lookout had been kept for it during "normal" migration periods. A young male with a few black feathers scattered about on the throat, top of head, and nape was collected February 14, 1948. This specimen appeared in the writer's yard under similar conditions of the year before when the first Bullock's Oriole was taken. It was very cold with a stiff northwest wind. Both specimens were probably attracted to the dooryard during the time of stress by pecan bits exposed in feeding trays.

Another Baltimore Oriole, also a young male, was collected on adjoining Birdsong Plantation on November 20, 1948, as it fed on ripe black gum, *Nyssa biflora*, fruits. This specimen, also showing a scattering of black feathers on the throat, top of head and mantle, was very much like a female in appearance. It was one of three orioles

feeding together on black gum fruits in a group of gums and oaks in a large, open pasture. A "cold front" had come blustering out of the Northwest on the late afternoon and night of the 19th. The Bullock's Oriole collected two days later was apparently one of this trio, while the third bird was seen on the first date only and was probably injured in the attempt to collect it. These birds were wild and wary, and difficult to observe and collect. The identity of the four orioles collected, three in the confusing plumage of immature birds, was confirmed by Messrs. Allen J. Duvall and M. Brooke Meanley, after comparison with specimens in the national collections in Washington.

A third Baltimore Oriole, an old male in brilliant plumage, was collected on November 25, 1949, in the same, tree-dotted pasture where the trio was found in 1948. This was a lone bird that appeared with a "cold front" and below freezing temperatures out of the Northwest. Through the kindness of Dr. J. Fred Denton of Augusta, Georgia, I am able to present the record of another November oriole for the state of Georgia. This was a male Baltimore Oriole in immature plumage taken by him in Richmond County on November 7, 1948. There are also a considerable number of sight records of "Baltimore Orioles" (some of which may well have been Bullock's Orioles in the confusing plumage of immature birds) almost every fall and winter in the southeast.

If the Baltimore Oriole at least is really on the way to becoming a winter resident of the Coastal Plain of the deep Southeast, the tendency seems to have been evidenced first and to the greatest extent in South Carolina (Sprunt, Alexander, Jr., and Chamberlain, E. Burnham, 'South Carolina Bird Life,' 1949: 497–499). Records appear to have become increasingly frequent in the coastal section there since 1933. "Thus, during excessively severe weather, at least three birds in as many counties made their appearance in the coast region in early 1934." Following 1941, many winter records were accumulated, January and February, 1949, showing the most of all. From the evidence presented, it seems that the wintering habit is now established in South Carolina. It may well be in other states of the southeastern group without being apparent, due to greater scarcity of field ornithologists.

One fact stands out; many of the orioles are first noted following the passing of "cold fronts" out of the northwest. Such storms in this region are usually accompanied by high winds and penetrating cold. It looks as though the orioles not infrequently ride in on these "cold fronts," possibly from points to the northwestward. The collection and critical examination of a representative series of these orioles might produce interesting results. Should the birds come from the northwest, occasional hybrids between the two species might be expected to appear (see Sutton, 'Oddly Plumaged Orioles from Western Oklahoma,' Auk, 55: 1–6, 1938). It may have been only a coincidence that both species were represented in the trio first observed in Grady County, Georgia, on November 20, 1949.

In any case, it would seem that the deep Southeast is now a favorable region for wintering orioles of this genus; the fine condition of the four specimens skinned is evidence of that. The writer, who is as familiar with the "agricultural face lifting" in South Carolina as he is with that in Georgia, has been impressed with the profound ecological changes in the region during the past 26 years; most of it in the last ten. The preference of both the Bullock's and the Baltimore Orioles for largely open country with scattered tree growth is now being met in the Southeast by the extensive areas being opened up for "improved pasture," an important part of the "agricultural revolution." More than two million acres of such pasture land have been developed in Georgia alone since 1825. A scattering of trees, many of which are

important fruit bearing species like the black gum, are customarily left for shade for the livestock. Tractor farming for peanuts, corn, cotton, and other row crops has opened up further large areas. "One mule" or "two mule" "patch farming" is on the way out, lessening the attraction of the country for such birds as the Bob-white, but improving it for others. The agricultural changes coming with such rapidity are being reflected by equally rapid changes in the birdlife; the case of the orioles is just one of many.—HERBERT L. STODDARD, SR., *Sherwood Plantation, Thomasville, Georgia.*

A Substitute Name for a Bulbul, *Pycnonotus*, of Northwestern India.—With the submergence of the genus "*Molpastes*" into *Pycnonotus*, now a general practice, *Molpastes haemorrhous pallida* Stuart Baker (Bull. Brit. Orn. Club, 38: 15, 1917) becomes preoccupied by *Pycnonotus layardi pallidus* Roberts (Journ. S. African Orn. Union, 8: 49, 1912).

For the Indian bird, I propose ***Pycnonotus cafer humayuni***, new name, in honor of Humayun Abdulali, an eminent worker in the ornithology of India.—H. G. DEIGNAN, *Smithsonian Institution, Washington, D. C.*

A Cardinal's, *Richmondena cardinalis*, Choice of Food for Adult and for Young.—There seem to be few data recorded on the extent to which adult birds select food for the young different from that which they prefer for themselves.

In April, 1942, a pair of Cardinals, banded in my yard in Ann Arbor, Michigan, the year before, built a nest seven feet from the ground in an arbor vitae beside the house across the street. The three young hatched on May 9, were fledged on May 20, and remained near the nest for some days. The adults regularly frequented my yard, gathering much of their food there. At noon on May 24 the adult male, on his way back to the nest territory, stopped at my feeding shelf with his beak full of small green worms such as I had often seen him feed to the young. He immediately put the worms down on the shelf and began cracking and eating sunflower seeds. After a minute or two he took the worms in his beak but again laid them down and ate a few more seeds. He then picked up the worms for the second time, flew across the street, and (presumably) fed the young. At 5:30 p. m. the same day I saw the whole incident repeated without noticeable variation.—JOSSELYN VAN TYNE, *University of Michigan Museum of Zoology, Ann Arbor.*

Courtship Feeding of Rocky Mountain Pine Grosbeak, *Pinicola enucleator*.—On July 15, 1949, Robert J. Niedrach of the Denver Museum of Natural History took me with him on an expedition to Echo Lake in Clear Creek County, Colorado, where in the summer of 1942 he and Alfred M. Bailey had discovered the first two nests of the Rocky Mountain Pine Grosbeak ever found. Our objective was to find more nesting grosbeaks which he could photograph in color. We found two nests with young in them in about three hours of searching.

In both instances we were guided to the nests by the adult birds after they had betrayed their presence to us by their soft call notes—*'cheeweel cheeweel'* The male bird of the first pair was immature, but the male of the second pair was a beautiful specimen, fully mature, with a rosy-red head and breast. He had been feeding, like the female, on the tender terminal buds of the Engelmann spruce. The throats of both birds were gorged with food.

We watched them flitting from tree to tree, uttering their soft call notes, until they came together on a branch. Immediately, the female fluttered her wings and begged for food which the male gave to her. It was not evident, however, that she swallowed

any of the food, for, a moment later, both birds darted to their nest where both participated in feeding their young.

Lack, in his review of avian courtship feeding (Auk, 57: 169–178, 1940) cited no instance of any bird feeding its mate in the post-incubation period. It is possible, however, that the males of a good many species, which habitually feed the females on the nest during incubation, also feed them occasionally both on the nest and off the nest after incubation is completed. Post-incubation feeding, when accompanied by begging on the part of the female, may indicate that the birds are preparing to nest a second time. Putnam has reported such behavior by Cedar Waxwings, *Bombycilla cedrorum*, between consecutive nestings (Wilson Bull., 61: 172, 1949). On the other hand, Brackbill's account of a pair of Black-capped Chickadees, *Parus atricapillus*, which engaged in off-the-nest, post-incubation feeding makes no mention of a second nesting (Auk, 66: 290–292, 1949).

There is no other record, so far as my knowledge goes, of unquestioned courtship feeding by the Pine Grosbeak. The European subspecies, *P. e. enucleator*, is included in Lack's list of courtship feeders on the basis of a brief entry in 'The Handbook of British Birds' (Witherby et al, 1938: 91): "Incubation.—By hen alone, fed by cock." Obviously, on-the-nest feeding during incubation is to be classified doubtfully as true courtship feeding.—FRANK C. CROSS, *9413 Second Ave., Silver Spring, Maryland.*

A Sick Tree Sparrow, *Spizella a. arborea*.—On January 4, 1948, began the greatest influx of Eastern Tree Sparrows we have ever experienced. These birds came in around our banding station in ever increasing flocks as the ground for weeks was continuously covered with snow. Temperatures remained low and at no time rose above freezing until February 25 when the first thaw came. In less than two months, 182 individuals of this species were banded; due to deep snow they were very hungry, easily trapped and many repeats (2057 in all) were made.

On January 22, Tree Sparrow No. 47-173326 was banded. This bird started repeating often in the traps from the day of banding; during the first four weeks nothing unusual was noted but its constant visits gave us the opportunity of close daily observation. On February 16 we noted its tail was missing; three days later new feathers were showing and in three weeks the complete tail was grown. When tail growth was less than half completed we found this bird in the traps and it appeared nearly double its normal size.

It was suffering with an air puff or subcutaneous emphrysema, the skin being separated from the flesh by an air space over most of the body, the neck, and the top of the head. I punctured the skin with a needle and the pressure was partly relieved. The next day the bird was again under high pressure; two punctures were made and most of the air pressed out with the fingers.

For the next three days some air was noted under the skin but, as the space was not filled out too severely and the bird seemed in no immediate distress, no punctures were made. We now noted that tail growth was completed during the first stages of the disease. The following day the air space was blown up higher than at any previous time and it seemed that drastic measures were necessary. I sterilized the small blade of a knife and an incision a quarter of an inch in length was made in the skin of neck. This released all the air and the bird was of normal size again.

During the seven days of illness, this bird was in the traps four or five times daily and apparently had a normal appetite. The last few days of February brought milder temperatures and with the snow melting most of our wintering Tree Sparrows quickly departed. None but our injured bird remained after March 4; on the first

capture this morning we found the patient entirely cured and no further pressure was noted. For the next nine days this bird alone remained, feeding in the traps nearly all the time. On March 13 after five visits to the traps, our bird departed; it had been taken 175 times in 52 days.—RAYMOND J. MIDDLETON, *Norristown, Pa.*

Apparent Song Imitation by Field Sparrow, *Spizella pusilla*.—According to Saunders, "in late summer" the Field Sparrow often varies the normal pattern of its song by repeating the usual phrase several times without pause, and by beginning and ending with a trill ('A Guide to Bird Songs,' 1935: 266). Sixty or 70 years ago, however, a Field Sparrow song in reverse sounded so unfamiliar to Bradford Torrey that he was unable to identify the singer until he had seen it ('Birds in the Bush,' 1891: 40).

On June 22, 1949, two of the most experienced bird observers in the Washington, D. C., area were similarly perplexed by a Field Sparrow which they came to hear at my invitation, in a suburban park near my home in Silver Spring, Maryland. This bird had first attracted my attention in mid-May by its remarkable singing which frequently featured the usual Field Sparrow song in reverse, together with the longer variations noted by Saunders. My friends, like Torrey, were so puzzled by the strange vocal performance that they were unwilling to identify the bird by its song alone.

During my early observations two or three other Field Sparrows in the same vicinity continued to sing the usual Field Sparrow songs, beginning with a series of long notes and ending with a trill. Several times toward the end of June, however, the song in reverse seemed to me to be coming from two birds. This was confirmed on June 29. These birds were not late summer singers. Saunders' statement does not contradict that such singing is unusual for May and June, and the inability of my friends to recognize the song corroborates its rarity in the Washington area. It seems to me that the circumstances justify considering the phenomenon an example of unusual song imitation. Saunders has reported that he has frequently found two Field Sparrows in the same area singing exactly or approximately the same song within the normal song pattern (Auk, 39: 398–99, 1922).—FRANK C. CROSS, *9413 Second Avenue, Silver Spring, Maryland.*

Western Swamp Sparrow, *Melospiza g. ericrypta*, in New Mexico.—On December 9, 1948, the writer collected a Western Swamp Sparrow from a flock of six individuals which were feeding in a flooded weed patch on the Bosque del Apache National Wildlife Refuge, approximately five miles south of San Antonio, New Mexico. The specimen proved to be a female and the skin has been deposited, with accession number 396220, in the Fish and Wildlife Service Unit in the U. S. National Museum, Washington, D. C. The writer wishes to thank Dr. Allan J. Duvall who kindly identified the specimen and checked the files for records of this species in the southwestern States.

The first record for the species was obtained on the Refuge December 3, followed by observations on December 8, 9, 24, 1948, January 1, 7, 12, 28, and February 4 and 18, 1949. The January 1 record was made at McAlister Lake approximately six miles northeast of Socorro, and the January 12 record was obtained from the cat-tail marshes on the north side of San Marcial Lake approximately 20 miles south of San Antonio.

So far as known to the writer, there is no previous published record of this species in New Mexico, although considerable winter field work has been done in the state, especially along the Rio Grande. There is a possibility of the species having been

overlooked on account of its secretive habits and association with other sparrows, or the species may have invaded this area in recent years and now occurs regularly in small numbers wherever suitable winter habitat is found. That the species is a regular winter resident along the middle Rio Grande is confirmed by observations on December 6 and 9, 1949, on the Bosque del Apache Wildlife Refuge. These records suggest that the Western Swamp Sparrow is a regular winter visitor in small numbers along the 35-mile course of the Rio Grande between Lemitar and San Marcial.

With this discovery, New Mexico becomes the last one of the southwestern States to report the occurrence of the Western Swamp Sparrow within its borders.—RAYMOND J. FLEETWOOD, *U. S. Fish and Wildlife Service, San Antonio, New Mexico.*

An Early Reference to "Territory."—As a footnote to Mrs. Nice's "The Theory of Territorialism and Its Development" (Fifty Years' Progress of American Ornithology 1883–1933, 1933: 89–100), it might be suggested that Frederic H. Kennard deserves mention in the historical background of territorialism by virtue of his paper, "The Habits and Individualities of the Red-shouldered Hawk (*Buteo lineatus*) in the Vicinity of Brookline, Mass.," (Auk, 11: 197–210, 1894). While he did not anticipate modern concepts of the theory, Kennard did use the word *territory* several times to indicate that particular, limited area in which a pair of hawks confines itself for hunting and breeding. Kennard remarked: "Thus it is that each pair of these birds seems to hunt over its own area exclusively, and by a tacit understanding, never seems to trespass upon that of its neighbor." Again, he says: "Once laying claim to any territory they are exclusive to a degree. This exclusiveness, however, seems to apply to their own species merely, for other Hawks are allowed to hunt in their territory at will." Kennard's use of the word *territory* may be coincidental; it is, nevertheless, suggestive.—AARON M. BAGG, *Holyoke, Mass.*

Autumnal Trans-Gulf Migrants and a New Record for the Yucatan Peninsula.—In connection with the recent discussions of migrations across the Gulf of Mexico, the following autumnal records should prove of interest.

An American friend has kindly sent me specimens of a young male *Parula americana pusilla* and a female *Wilsonia canadensis* which he collected on August 30, 1949, while on a fishing boat about 30 kilometers off the village of Santa Clara, on the northern coast of Yucatan.

Both birds were exhausted and landed on the boat. The Parula Warbler was caught by hand and the Canada Warbler in a net.

In addition to the birds collected, he reported that there was at least one group of three warblers and another group of eight or nine which passed over about 100 feet above the water. As closely as he could ascertain without a compass, the birds were coming from due north while a brisk northeasterly breeze somewhat aided their flight.

The Parula Warbler is a common winter visitor on the Peninsula, but the Canada Warbler has never been reported from there. While Canada Warblers are not unexpected, they must be rather uncommon. Perhaps they are only transients on the Peninsula in the fall since, during extensive field work from October, 1948, to August, 1949, I failed to observe this bird in either the state of Yucatan or in the territory of Quintana Roo. During the spring migration I took particular care to collect northern migrants.

At noon on September 3, 1949, the observer was again out in a boat and saw a flock of about 50 Caprimulgidae, presumably nighthawks, flying towards Santa Clara.

Several days later he collected a number of swallows which were flying over the beach at the village. I have not yet received these specimens but he was able to identify positively a Barn Swallow, *Hirundo rustica*, and from his description I believe he obtained several Cliff Swallows, *Petrochelidon pyrrhonota*.—RAYMOND A. PAYNTER, JR., *Osborn Zoological Laboratory, Yale University, New Haven, Connecticut.*

NOTES AND NEWS

The Recent Literature section of 'The Auk' is an important component of our journal as a working tool for research in ornithology and in keeping the entire membership informed of progress in this field. It was the general consensus of opinion at the Council Meeting in Minneapolis that the section needs to be strengthened by better coverage of world literature and by an increased number of annotations and critical reviews of important studies in books and journals. Later perhaps the material will be classified by fields of interest. These suggestions will be followed as rapidly as possible.

Also of significance in our attempts to improve 'The Auk' is the appointment of an Illustrations Committee, now in progress. This committee will aid the Editor in the selection and preparation of material for graphs, maps, photographs, and colored plates. It is still expected that authors will prepare illustrations with the greatest of care, but they, as well as the Editor, will have the benefit of suggestions from the committee when papers are submitted.

In the future all advertisements will be limited to the back part of 'The Auk.' Anyone wishing a new frontispiece for the October, 1950, number, *without* the advertisement on the back of it, may secure a copy simply by writing to Dr. R. A. Moser, our Treasurer.

The Japanese journal of ornithology 'Tori' has honored Dr. Nagamichi Kuroda by issuing volume 12 (59), published in December, 1949, as a Commemoration Number. Dr. Kuroda has played an important rôle in Asiatic ornithology.

RECENT LITERATURE

Principles of Animal Ecology.—W. C. Allee, A. E. Emerson, O. Park, T. Park, and K. P. Schmidt. (W. B. Saunders Co., Philadelphia), xii + 837 pp., 263 figs., 1949. Price, $14.00.—This large, ambitious, and important work attempts to define the scope of modern ecology by organizing the subject matter of that field according to general principles. That such a review has been needed is evidenced by the wide variation in the content of books dealing with ecology, in the attention given ecology in elementary texts in biology, and in biologists' attitudes toward ecology. In this book we have not only an enormous amount of ecological information for which there is wide interest, but information compiled and examined by a leading group of ecologists who give us the benefit of their conclusions and views. The work of students of special groups, ornithologists and others, carries promise to the extent that it is guided by an up-to-date knowledge of fundamental biological principles. In the light of all these considerations, this book commands our attention and close study.

Five sections deal, respectively, with the history of ecology, analysis of the environment, populations, communities, and evolution. This material is divided among 35 chapters. The historical section, 60 pages in length, is divided into two parts. In the first part (by Allee), ecological backgrounds and growth are examined from the Greeks up to 1900; the material is organized under topic headings such as environmental physiology, economic biology, limnology, the naturalists, etc. The second part (by T. Park) is a review of progress in ecology since 1900 by decades. The section on environment (by Allee) treats in conventional manner such topics as heat, light, water, gases, dissolved salts, soil, etc. The section on populations (by T. Park), following an introduction on properties of populations, definitions, and methods of study, deals with such topics as mortality, age-distribution, life-tables, growth-form of populations, and population factors. This section promises to be especially useful to field ornithologists interested in population phenomena and should serve as much as any other section of the book to channel research effort along profitable lines. There follow chapters that are among the best written and best organized for the purposes of this book, a not unexpected result since they represent the special research fields of two of the authors. An enormous amount of material on animal aggregations is well condensed (by Allee) into a chapter of only 26 pages; the same is true of a 17-page chapter on insect societies (by Emerson). The section on communities (by O. Park) is concerned with stratification, metabolism, periodism, succession, and biomes (the last written with Schmidt). To varying degree, community concepts are also discussed in the other sections. The section on evolution (by Emerson) examines ecological aspects of such phenomena as isolation, natural selection, competition, adaptation, regressive evolution, and the consequences of ecological association.

For purposes of this review, while some comment on the book as a whole will be ventured, it seems best to discuss only one of the sections, and I choose the one on communities. Even so, the points raised in the following paragraphs are only a few of those deserving attention. There is a continually growing literature on habitat distribution and community relations of birds, on habitat factors in relation to speciation, and on biogeography generally. The need for a clear presentation and critical appraisal of community concepts useful in the description and analysis of distributional relations of birds and other organisms is accordingly serious. Moreover, a

part of community ecology in the past has consisted of tagging a lot of descriptive, naturalistic information with obscurantist terms, not infrequently accompanied by swoons over how very interrelated plants and animals are, how very supraorganismic it all is! Some real curiosity and anticipation is therefore aroused by the appearance of a major review of the community approach in ecology.

The factual basis of community concepts is best presented for forests, particularly temperate deciduous and tropical rain forests. For students without extensive field experience, efforts to visualize some of the situations may be strained and the associated principles therefore somewhat elusive. Nevertheless, the decision to stress forest communities has been wise since these formations are among the most, if not *the* most, extensively described in the literature. The wealth of detail and documentation makes this an indispensible source for students of temperate forests.

The point of view of the community as a supraorganism is evident throughout and, I think, overworked. Relatively frequent phrases such as "self-sustaining," "self-supporting," "highly integrated reality," and others with parallel implications serve as reminders. This is carried slightly too far when we are told (p. 546) that "The community is *more* complex, *stable*, *independent*, and less mobile *than its parts*"! (Italics mine.) Without pausing to dwell on the concept of the supraorganism, which has its instructive, philosophical points, we should note that in this book as elsewhere in the ecological literature, its application to major communities such as forests results in a de-emphasis of the need for critical study of edge phenomena and of the true nature of distribution in the mixed populations that comprise a given community. Interested readers should refer to a recent illuminating discussion of this point by Elton (Journ. Ecol., 37: 1–23, 1949). The idea that integrative phenomena operative in closed, stratified communities such as temperate and tropical forests occur generally and to more or less comparable degree is still a preconception fostered by this book's preoccupation with the idea of the supraorganism. Instead of almost apologizing for the "exceptions to the definiteness of the functional boundary" (p. 440), this book might well have explored community boundaries from a more realistic point of view. Important cross-boundary movements of animals, seasonal and diurnal, *are* described, but these seem to me to be played down in the interest of the supraorganism. In juxtaposed major communities such as sclerophyll woodland and grassland, or scrub desert and grassland, it is not easy to speak so glibly of a "functional boundary" as in the case of temperate deciduous forest and grassland.

Use of terms is, according to the preface, limited to those which serve as "a well-authenticated index of the principle." This objective is largely achieved. Some exceptions occur: On page 486, new terms of doubtful value are coined for categories of soil organisms. There is also some toying with definitions of, for example, diurnal and crepuscular (p. 546). The term "lamiation" (meaning layer or stratum), used on page 481 and elsewhere, can be discarded as unnecessary. The authors warn readers (p. 574) that the terminology associated with the concept of the climax "is not a subject for the unwary or for the impatient," and it should be noted that the definitions of postclimax, preclimax, and proclimax that appear there are inadequate.

The doctrinaire aspects of community ecology have tended to obscure its usable descriptive data and the problems posed by them. The section on communities helps to right this, but not to the extent one might hope. Organisms do occur in recognizable assemblages, and ecologists strive to study and analyze the consequences of this assembling. From this have emerged the concepts of the pyramid of numbers and succession, which, with all their attendant principles and implications, are fundamental. Otherwise, the contribution of community ecology is mainly one of

description of biotic assemblages, something which obviously must be done, but the superstructure of assumption and interpretation has been and still is too heavy. Notwithstanding the authors' own comment on page 68 which agrees with this, I think that parts of the book are vulnerable to the same criticism.

Here are some statements subject to challenge: "Ecotones are naturally intermediate between the communities concerned in their physical environment and biota" (p. 477). (This is an unwarrantedly sweeping, if not misleading statement. Is the interspersion of the components of two communities and the phenomenon we speak of as edge effect indicative merely of a state of intermediacy?) "Volant animals, such as birds, may cover a disproportionately large area in relation to their body size" (p. 524). (Is the suggestion intended that by the rules of community ecology birds have no business trafficking over so much ground? And granting the point, for the moment, is it a supportable generalization, or even a meaningful one now?) "Diel activities [day-night rhythms] may be considered in two major categories: . . . reproduction . . . and feeding. It is interesting to note that . . . sheltering, from the point of view of diel periodicity, is the complement of the period of activity" (pp. 551–552). (Omissions from the quotation, so far as I can see, do no violence to the intended meaning. Is it the writer's purpose to say that shelter relationships are absent in the period of activity? What about predation pressure in relation to variation in cover wherein the individuals of a species may be foraging, or resting, or loafing?)

A procedure dangerously pursued in community ecology in the past is extraction and overplay of scant data from faunal works. An example in this book is provided by a table of "stratal equivalents" in forest communities of different land regions of the world (pp. 492–493). By "stratal equivalents" is meant species occupying essentially the same niche in areas that are widely separated geographically. From the possible list of forest-dwelling owls of North America, only the barred, long-eared, and "North American screech owls" are listed. Are these really ecologically equivalent to the "Stygian owl" and "Crested screech owl" of Brazil as listed? Why are the other North American forest-dwelling owls excluded? Because for them there are no ecological equivalents in other faunal regions? All the owls listed are said to feed "in all strata above [the] subterranean" [a safe statement]. Is *this* the basis for postulation of equivalence? The arrangement of ornithological data here exemplifies a dubious choice of distributional facts to support what is actually an important basic concept, but for which the critical evidence in entire groups such as owls is unavailable. The matter of ecological equivalents is presented in much better perspective in the section on evolution (pages 666 ff.).

Considering all this, one welcomes a few notes of cold realism here and there. On page 542, regarding nature of various migratory movements, "The complete answer includes a knowledge of the life span of the several species." Better yet, on page 6, "The study of populations . . . yields principles that clarify the nature of group interactions, interactions that do not exist at the level of the single organism, and that are too complex at the community level to be analyzed in a quantitative way." This seems to me to be a tacit admission that the ideal of community ecology is not only unreasonable in practical design of effective research, but that in fact the problems it poses must be attacked from another point-of-view.

There is a brief chapter on biomes organized merely to put over the idea of types or kinds of biomes from a world-distribution point-of-view. The map of world vegetation (p. 581) is not only, as labelled, "extremely schematic," but so useless for mountainous regions that the latter might better have been left blank. Only the

tundra, deciduous forest, grassland, desert (then only hot desert), and tropical forests (then only tropical rain forests) are considered. Neither tropical deciduous forest, nor such types as chaparral or sclerophyll woodland are discussed, or even mentioned for that matter. This is not intended as criticism, but as a report on the book's coverage of this topic, inasmuch as the material presented seems adequate for the authors' objective.

Most disappointing in the section on communities is the treatment of marine biota, particularly that of the intertidal. Serious students of the ecology of the littoral will find this treatment sketchy and, at some points, misleading. Intertidal mud flats are disposed of in a 14-line paragraph (p. 458) without any references to important studies in the literature or to an earlier discussion of substrates (p. 159). [Generally, however, there are helpful cross-references between sections.] On page 458 and elsewhere genera of invertebrates typical of a given habitat are enumerated, but one is not told whether the cited assemblages are from the Atlantic coast or elsewhere. The complex Pacific Coast tidal cycle on page 455 is not accompanied by any mention of other, simpler types of tidal cycles, particularly that of the Atlantic. It is implied (p. 457) that abundant algal growth of the rocky intertidal is the food of numerous herbivores, thus indicating a parallelism with terrestrial communities; but if such a parallel really exists, at least in the rocky intertidal of the central California coast, the number of littoral species feeding on the lush algal growth seems, in the light of present knowledge, unexplainably low and plankton feeders preponderate in numbers of species and individuals. There is a revealing lapse in the reference to succession in mussel beds on Monterey Bay (p. 570), which succession is simply said to occur on "any clean area" of the marine littoral! Finally, the idea of the marine realm as one biome is of course logical from the point of view of community metabolism, if analogy is to be drawn between terrestrial and marine environments so far as biomes are concerned (see Hutchinson, Ecol., 21: 267, 1940). But in this book, the idea of the marine realm as a single biome is emphasized to the exclusion of a constructive, practical classification of marine associations such as those of the intertidal. The logical recognition of the entire marine realm as one biome should establish, I think once and for all, the fact that the efforts of community ecologists to set forth close classificatory parallels between land and sea are futile.

The initial impression that this book is comprehensive in its coverage of the field is therefore not borne out by closer examination. Not only are some aspects of ecology treated briefly or even sketchily, but at least one other, one of interest to many ornithologists, is just mentioned. This is the field of behavior. It is stated (p. 7) that "innate behavior patterns . . . have real and far-reaching ecological implications." Reference is made to a recent review paper by Tinbergen, but the subject is not discussed. Such terms as "releaser" and "display" do not appear in the index. No reference is made to, for example, E. A. Armstrong's books of 1942 and 1947 on bird behavior, the latter of which, perhaps appearing too late to be cited, contains the latest comprehensive review of the subject of territoriality.

The wealth of detail plus lapses into a ponderous and academic style of writing do not make this book easy reading. Sometimes the obvious is belabored. For example, on page 437, "physiological recuperation, therefore, is consumated [*sic*] within the environment." And on page 265, "The first question asked by the population student is 'How many?' To have meaning such a numerical statement must enumerate kinds that have likeness. This gives the statement dimensional homogeneity." Sometimes there is unnecessary fussiness over objectivity as, for example, the reference on page 7 to "the matter of so-called habitat selection or, objectively

expressed, of modality." It is observed (p. 8) that many naturalists "give strong avoidance reactions to the carefully objective and perhaps over-corrected point of view of critical modern students." Evidently critical modern students occasionally feel themselves stewing in the juice of their own intellectualist perfectionism!

The illustrations with few exceptions are excellent. The double-column format reduces difficulty of reading and facilitates search for particular points. The subject index of 35 triple-column pages is very good. An author index is provided in a 71-page bibliography, where each item is followed by citations to text pages on which reference is made to a given paper. The titles of papers are given in full. The bibliography is thus an exceedingly useful one.

Some of the books or papers listed in the bibliography and cited in the text only once could well have been omitted considering the adequacy or, what is more important, the greater suitability of other sources also listed. For example, on page 535 and only there, three popular works on winter birds are used to support a point about sparse populations of residents in the northeast when other, more advanced and basically ecological papers on winter birds are also listed in the bibliography. Nice's "Watcher at the Nest," a popular work, is cited only once (p. 412) along with her relevant basic papers. Griscom's "Birds of Guatemala," published in 1932, is the sole reference used on page 582 to support a point on time required for species differentiation in vertebrates when there are many recent and authoritative books and papers dealing with this subject, and some of them are listed in the bibliography. Also, some important works are not cited. I have already mentioned Armstrong's books. Other examples are Ricketts and Calvin's "Between Pacific Tides" and Tansley's "The British Islands and Their Vegetation." The latter book not only provides a fund of factual material useful to land ecologists in temperate regions, but takes a sober position with regard to the theory and terms of the American plant ecologist Clements. Tansley's chapters dealing with general theory can serve as a valuable guide to persons obliged to deal in any way with description and analysis of North American vegetation.

It would be gross error for anyone to minimize the importance of this book. Certain shortcomings are inevitable in an undertaking of such enormity. Notwithstanding some of those mentioned above, this book sets forth the content and guiding principles of animal ecology in a way and on a scale not achieved by any previous work. The historical resume and the section on populations are especially significant summaries. The generally encyclopedic approach of the book makes it unsuitable for use as a text; rather, the crying need for a good text in ecology is aggravated. But as a source book and guide, the great value of this volume is already established; it should emerge as a landmark in the history of ecology.—FRANK A. PITELKA.

Grønlands / Fugle / The Birds of Greenland. Part I.—Finn Salomonsen with paintings by Gitz-Johansen. (Einar Munksgaard, Copenhagen), pp. 1–158, 17 col. pls., 1950. Price, $9.00.—Volume 2 is to appear in the spring of 1951 and volume 3 in the autumn of that year. The price per volume will be $9.00. The present part contains information on the loons, petrels and shearwaters, anseriformes, and cormorants, in that order.

This work is somewhat unusual in that it is set in 2-column format—the left column is in Danish and the right in English. There is no table of contents or index, but these may appear with the last volume. The reproductions of the water-colors by Gitz-Johansen are interesting and perhaps "artistic." However, as illustrations of birds they are not the best; some appear rough, sketchy, and flat.

Salomonsen's text, based upon his own intimate knowledge and pertinent references to literature, constitutes a concisely summarized natural history of the birds, including information on taxonomy, the different plumages, breeding range and season, behavior throughout the year but particularly during the nesting period, migration routes and times, and notes on foods taken. The habitat of each species is outlined in some detail, as is the relative abundance of the various birds; numbers of birds in the colonies are given in many instances.

The information is presented in readable, non-technical fashion and furnishes a good, general background for an understanding of the birds of this relatively unknown, ornithologically at least, part of the world.—H. I. FISHER.

Distributional Check-List of the Birds of Mexico. Pt. 1.—Herbert Friedmann, Ludlow Griscom and Robert T. Moore. Cooper Orn. Club, Pacific Coast Avifauna No. 29: 202, 2 pls., June 30,[1] 1950. The first part of the long-awaited "Mexican Check-List" covers the families from the Tinamidae to Trochilidae inclusive, following the sequence of Wetmore's 'Systematic Classification for the Birds of the World.' The "compiling group" under the chairmanship of R. T. Moore has not only consulted all literature on Mexican birds but has also drawn on unpublished material in various museums and private collections in the United States as well as the Museo Nacional de Historia Natural in México City and the British Museum (Natural History). Records included on the basis of unpublished specimens are designated by a letter corresponding to the name of the institution as shown on a table in the introduction. In the Check-List there is a binomial species heading outlining the range of the species as a whole, followed by the subspecific headings which also contain a reference to the original description and a detailed statement of the range in México, including in a general way habitat and altitudinal preferences. In stating Mexican ranges the authors have adopted a sequence of states, as explained in the introduction, dividing the country into four more or less equal bands running from north to south, beginning on the western side and ending with the eastern portion. It is rather a pity that the authors could not have been a little more critical in regard to the recognition of subspecies, but they explain that "it is unwise to settle questions involving the validity of some forms by a simple vote." Consequently they have admitted "all forms except those which they were unanimously against recognizing." However, footnotes such as "this race is only doubtfully distinct," or "status of this subspecies uncertain" appear more or less frequently with an occasional mention of a name in a footnote which is "considered a synonym" or "requires confirmation." Under the scientific name in the specific headings are given the American, Spanish and sometimes Indian vernacular names, while under the subspecific headings are found the Spanish names supplied by Dr. Rafael Martín del Campo.

The 'Distributional Check-List of the Birds of México' promises to be a most useful book to all interested in Mexican ornithology, and it is to be hoped that the preparation of the second part will not be unduly delayed.—J. L. PETERS.

Birds of Paradise / and / Bower Birds.—Tom Iredale. (Georgian House, Melbourne), pp. xii + 239, 1 folding map, 33 col. pls. 1950. Price, 5 Guineas net.—Designed as a handbook to these birds, this publication will fulfill a definite desire on the part of many.

The introduction includes a brief description of New Guinea, the area which for all practical purposes embraces the ranges of all these birds, an account of the history

[1] The actual date of publication is probably July 20, on which date copies were received at the M. V. Z. and the printer was preparing packages for delivery to the post office. *fide* F. A. Pitelka, *in litt.*

of discovery of the Birds of Paradise and the Bower Birds, and a general treatment of their taxonomic history.

Each species is considered individually as concerns: general distribution; habitat; history of discovery (along with occasional taxonomic remarks); detailed appearance; behavior; voice; display; nests; and eggs. Although all these aspects are not included for all forms, the author seems to have done a good job within the limitations of space and known facts concerning the natural history of these birds.

Each species is illustrated by one or more colored figures by Lilian Medland (Mrs. Iredale), and the illustrations are superb even though the natural brightness and irridescence could not always be shown. Usually the male and female are shown; in some instances the male is shown in various attitudes of display, and immatures are figured occasionally. Each plate is faced by a black and white outline drawing, with legends, of the species shown in color; this makes for easier identification and prevents cluttering and unbalancing of the plates. One hundred Birds of Paradise and 38 Bower Birds are thus illustrated.

There is no index but the table of contents may be used instead. On pages 227–232 is a check-list of these birds. The only part of the book that disappoints this reviewer is the bibliography, and this is perhaps not too important in a handbook. The bibliography consists of the names of individuals who have contributed to our knowledge of these birds (and their main contributions are noted), but very few actual citations are given. For example, under E. Hartert we find, along with other information, "Sometimes wrote about the Birds of Paradise and their eggs," with no references. It is thus difficult or impossible for one to use.

Some may object to various aspects of the taxonomic discussion and choice of names, but these are relatively minor in a publication of this sort.

The book is easily read, well constructed, and beautifully illustrated. There seems to be little doubt that it will become a classic and a collector's item for amateur and professional ornithologists.—H. I. Fisher.

Lista de las Aves de Venezuela con su Distribución. Parte 2. Passeriformes.—William H. Phelps and William H. Phelps, Jr. Bol. Soc. Venez. Ciencias Nat., 12 (75): 1–427, map, March, 1950.—For some years Dr. Phelps and his son have been investigating the avifauna of Venezuela. They have made numerous personal expeditions to unexplored areas with results that have proved valuable in other fields than ornithology and have sent experienced collectors throughout the country. They have thus built up a vast collection of some 48,000 Venezuelan birds that is unequalled by any other museum in the world, if not by all of them combined.

Numerous reports on parts of this splendid material have been made as the collection has grown, and so much of the country has now been covered and so much added to the previous records that it has proved desirable and practicable to prepare a check-list showing the present state of knowledge concerning the status and distribution of the Venezuelan birds. The present publication covers the Passeriformes and forms part 2 of the work, although it is the first to be published. A wealth of information is provided. The accepted scientific name; a local common name; original reference; other synonymy when the type locality is in Venezuela; distribution, including zone and preferred habitat; newly recorded Venezuelan localities (emphasized in bold-faced type); extralimital range; notation if migratory; the number of specimens in the Phelps Collection. These data are supplied for each species or subspecies. A new map of the country is provided, with a gazetteer of all localities mentioned in the text.

There are supplementary lists of extralimital and hypothetical forms and records of Venezuelan significance, and various tabulations of genera, species and subspecies found in the country, described as new from the Phelps Collection or recorded for the first time in Venezuela, and other such information, restricted to the group covered by the present publication, the Passeriformes. The figures are impressive. There are recognized in this Order in Venezuela, 317 genera and 689 species, comprising 1127 species and subspecies of which the Phelps Collection lacks but 24!

Critical analyses are omitted, having been anticipated by the technical discussions in previous papers, although there is occasional brief mention of the factors governing the acceptance or rejection of a form. This has kept the list compact and uniform. Scientific and common names are adequately indexed. Altogether, it is difficult to suggest any improvement in the manner of presentation.

The authors are continuing their investigations and explorations so additions and changes may be expected from time to time, as is true of any check-list when active work is being done. In the meantime we are fortunate in having this comprehensive summary of Venezuelan birds and such active and skilled investigators on the ground to continue the work. The remaining first part is promised for early publication in 1951. It will be awaited with much interest.—JOHN T. ZIMMER.

Robin Redbreast.—David Lack. (Oxford Univ. Press, London), pp. xi + 224, 15 figs., 8 pls., October 12, 1950. Price, $4.00.—As noted in the Preface, "this book is concerned with unnatural, not natural, history and its object is entertainment, not the advancement of learning." Robins, *Erithacus rubicula*, have for centuries held a revered position in English life, and this book attempts to reveal the extensiveness, depth, and quality of its place by noting allusions to the Robins in the general literature of England and Europe. Thus the body of the text is made up of quotations of legends, essays, speeches, and poems which refer, however distantly, to this bird.

Some of the quoted material is of such length and interest that the Robin is lost from view, but this is probably as the author wishes for he notes that the bird is not the main theme but rather the excuse for a rambling, descriptive "journey" through England (and its mores).—H. I. FISHER.

Ornithologie als Biologische Wissenschaft: 28 Beiträge als Festschrift zum 60. Geburtstag von Erwin Stresemann (22. November 1949).—Edited by Ernst Mayr and Ernst Schüz. (Carl Winter, Heidelberg), xii + 291 pp. 1949. Price, 18 marks ($4.50).—The friends of the eminent ornithologist Erwin Stresemann could not have chosen a more fitting way to honor him than the publication of this fine group of scholarly contributions to ornithology in a form calculated to reach biologists generally—as articles in even the best ornithological journals often fail to do. Authors from Germany, Austria, England, France, The Netherlands, Finland, the United States, Mexico, and Brazil have joined to pay this tribute to Dr. Stresemann. Six of the 28 articles are in English (with a seventh summarized in English), one in French, the remainder in German.

The volume opens with a well worded tribute to Dr. Stresemann, enumerating some of his outstanding contributions to ornithology. The articles that follow are classified under the following categories: evolution and systematics (articles by J. Berlioz, J. P. Chapin, J. Delacour, K. Günther, E. Mayr, W. Meise, A. H. Miller, R. C. Murphy, and H. Weigold); embryology (E. Witschi); behavior (O. Koehler, H. Laven, K. Lorenz, M. M. Nice); ecology and functional anatomy (N. Tinbergen, R. Kuhk, R. E. Moreau, P. Palmgren, J. Peitzmeier, L. Schuster, E. Schüz, H. Sick, H.

O. Wagner); parasitology (W. Eichler); migration (R. Drost, G. von Schweppenburg, G. Kramer); and the history of ornithology (F. Goethe).

There is not space to mention here all the contributions, even by title, but a few may be noted briefly if only to indicate the scope and variety of the volume and its importance to ornithologists, however specialized their particular interests.

One of the most startling discoveries reported in this volume is R. C. Murphy's new species of gadfly petrel, *Pterodroma ultima*, described from 94 specimens after 20 years' investigation.

A. H. Miller discusses "some ecologic and morphologic considerations in the evolution of higher taxonomic categories" as exemplified in North American thrashers and mockingbirds.

Margaret M. Nice considerably revises her earlier published stand on the "question of sexual dominance" in birds.

N. Tinbergen describes and interprets some points in the "nesting behavior of the Herring Gull."

H. O. Wagner makes a stimulating "contribution to the anatomy and biology of the tinamous (Tinamidae)."

R. Kuhk treats the "breeding biology of the Rough-legged [Tengmalm's] Owl, *Aegolius funereus* (L.)."

And W. Meise writes "on a generic hybrid and a species pair of tyrant flycatchers, with remarks on migration distance and wing form."

The volume is well edited and printed, but it is not indexed, and unfortunately many of the contributions do not have summaries.—JOSSELYN VAN TYNE.

The Birds of Tropical West Africa.—Bannerman, D. A. (Crown Agents for Colonies, 4 Milbank, London, S. W. 1), vol. 7: pp. i–xxv + 1–413, 14 col. pls., 40 figs., January 1, 1949.—The seventh volume of Dr. D. A. Bannerman's 'Birds of Tropical West Africa' concludes the general survey of the species inhabiting this vast region, the publication of which began in 1930. As it always happens, however, with a long and ambitious work issued in several volumes over a period of years, there will be an additional volume of addenda.

All the volumes are full of useful information. The author has very intelligently stimulated the interest of many residents of West Africa who have sent him new and valuable observations on the life habits of the birds to add to what could already be found in literature. This is a special feature of the work, particularly welcome as the author himself had few opportunities to visit Africa. A great advantage is also the large number of illustrations, colored plates and figures in the text, including the excellent and unusual keys, that make it easy for beginners and laymen to use the book. There are 14 colored plates in the present volume, all due to the talent of the veteran bird artist, George Lodge. They are charming pictures, but in many cases the shape and posture of birds familiar to field ornithologists in Africa and to aviculturists the world over are not too accurate.

The lack of sufficient experience with the birds in life has been a handicap to the author and the main criticism to be made of this otherwise excellently conceived work is that it is based almost exclusively on the study of museum series and on literature. Taxonomic arrangements unacceptable to modern workers are no doubt due to too limited a knowledge of habits and behavior. Also an insufficient general comprehension of the avifauna of other parts of the world is noticeable.

The present volume deals with the Weavers, a group of Passerine birds which has received much attention from Sushkin, Chapin and myself in past years. Their systematic treatment is far from satisfactory. The author still places the sparrows

(Passerinae) among the Fringillidae, instead of in the Ploceidae where they belong according to Sushkin's conclusions, almost universally accepted today. The Buffalo-Weavers (*Bubalornis*) are kept as a separate family against Sushkin's better judgment; the latter's opinion has in fact long been adopted by Chapin, although Bannerman believes that he agrees with him in rejecting it. This remark applies to many other similar statements in the course of the volume, particularly to an unfortunate splitting of genera in the *Ploceus* group of Ploceinae. Sclater's sequences and taxonomy in his 'Systema Avium Aethiopicarum' are much more acceptable, with some minor changes.

When it comes to the Bishops and Whydahs, Bannerman seems to have adopted or rejected some of my own conclusions ('Monographie des Veuves,' Oiseau, 1933–1934) without much consistency. He upholds several genera and species which, in my opinion, should be merged. It seems curious that he should accept with me *Euplectes franciscana* as a subspecies of *E. oryx*, two forms which differ rather considerably in the pattern of the breeding dress of the males, and between which there are no known intermediates, while he maintains *E. afra* as a separate species when it is obviously a subspecies of *E. taha*. These closely related forms are linked by intermediate and variable populations.

The Waxbills seem to have been particularly mistreated. Bannerman has rejected most of the conclusions of my own revision (Zoologica, 28: 69–86, 1943), but I feel that, with a few exceptions concerning the lumping of two species (*Estrilda melpoda* and *E. paludicola* are better considered two separate species, and perhaps even *E. bengalus* and *E. angolensis*), my arrangement explains relationships and affinities as well as can be done in our present state of knowledge. Bannerman's indignation at "time honored names" being discarded as the result of my lumping cannot be taken seriously as they affect seven fairly recent subspecific terms only. I would like to point out that, among other inconsistencies, it is going a little far to place in two separate genera (*Lagonosticta* and *Estrilda*) such likely subspecies of the same species as *coerulescens* and *perreini*, differing only in the color of the tail. One may judge by glancing at plate 12 where the two birds are figured side by side. Also the evident conspecificity of *Pytilia afra* and *P. hypogrammica* is ignored.

The treatment of the Combassous, borrowed from C. H. B. Grant, seems inadmissible. To separate specifically two forms from Senegal (*aenea* from *chalybeata*) for the mere reason of a more or less greenish gloss of the steel-blue breeding plumage is fantastic; they are color phases at the most. The different shades and the intensity of the reflections are poor distinctive characteristics; the color of the remiges and rectrices, and that of the feet and bill, as well as the life habits, have much greater significance. We are today inclined to recognize only three species of these short-tailed *Vidua:* 1) *chalybeata,* with four or five races—*chalybeata, neumanni, ultramarina, orientalis,* and probably *codringtoni;* 2) *amauropteryx,* including *camerunensis* and probably *nigeriae;* 3) *funerea,* including *purpurascens* and *wilsoni.* This is even a simplification of my proposals of 1934. It must be admitted that much more remains to be learned of this puzzling group of parasitic weavers, but Grant's arrangement is unnecessarily loaded with "species." To be "strongly opposed" to my placing the Combassous in the genus *Vidua,* as stated on p. 369, one must disregard the existence of *Vidua hypocherina* which is entirely similar to the Combassous except that it has the elongated tail of the other *Vidua;* it affords a perfect transition between the latter and the short-tailed species. As for *Vidua* (*Steganura*) *paradisea,* the author holds fast to the conception of two species, while the majority of students admit the occurrence in some parts of the range

of the species of two phases of breeding plumage in the males. As long as the males in eclipse, the females, and the young remain impossible to tell apart, it is hard to advance any other explanation.

Bannerman's decision to include *Anomalospiza* in the Viduinae is also unacceptable to me; the color pattern in both sexes is against it, particularly the striated plumage of the young and females, and they are certainly closer to such Ploceinae as *Quelea* and *Foudia*. Their parasitism is very different from the very specific one of the *Vidua*. Finally, an exception must be taken to the footnote on p. 229. Line priority, according to the International Rules of Zoological Nomenclature, Art. 28, has no value, and the designation of the first reviser must be accepted. Therefore, *bicolor* is the proper name for this species of *Lonchura* (= *Spermestes*), and not *poensis*, as Bannerman believes, because it has been chosen by Sclater on account of its greater suitability, a perfectly valid action.

I have felt that these remarks on systematics should be made before highly commending this otherwise very substantial and well prepared work, which will long remain the base for all further studies of West African bird life.—JEAN DELACOUR.

Studies in Bird Migration / being the Collected Papers / of / H. Chr. C. Mortensen / 1856–1921.—Edited by Poul Jespersen and Å. Vedel Täning. (Dansk Ornith. Forening, (Einar Munksgaard) Copenhagen), pp. 1–271, maps and photos. 1950. Price, Danish kr. 18.—This volume is a memorial to Mortensen whose pioneer work on Starlings over 50 years ago initiated the banding of birds for scientific study. The introduction includes a brief biography and a list of some 30 publications by Mortensen; 19 of them are reproduced in their entirety in this book.

Most of his papers appeared originally in Danish, and their translation into English by H. M. Kyle will make them more available. The bulk of the material deals with records of recovered birds, although the development of methods of capture, bands, and instructions for banding is clearly shown in the sequence. The later papers show the initial collation of recoveries to demonstrate migration routes, life cycles, etc. One, published in 1910, is on brood-size in Danish birds.

There are several tables of the numbers of birds banded by Mortensen and recovered. Starting in 1900, Starlings were marked for a number of years. Realizing that his results from this were not too productive, he began to band storks, teal, herons, buteos, pintails, gulls, and other birds.

The most complete information is on: the stork, *Ciconia alba;* the teal, *Anas crecca;* the heron, *Ardea cinerea;* the pintail, *Anas acuta*, and various species of gulls.—H. I. FISHER.

Geographic Variation and the Species Problem in the Shore-bird Genus Limnodromus.—Frank A. Pitelka. Univ. Calif. Publ. Zoöl., 50: 1–108, 10 pl., 9 text-figs., 1950.—Whether Long-billed and Short-billed Dowitchers are one or two species, whether every dowitcher can be unequivocally identified, and whether the Short-billed Dowitcher varies geographically are questions which many American ornithologists have tried to answer, particularly during the past 20 years. Pitelka gives an admirably thorough survey of these questions which clearly establishes the following facts: Long-billed (*scolopaceus*) and Short-billed (*griseus*) Dowitchers are allopatric. Their ranges are separated by an unsurveyed area in Alaska, but no intermediate specimens have ever been found even among migrants. Pitelka therefore grants *scolopaceus* species rank. The Shortbill changes clinally from Alaska to Ungava and is divided by Pitelka into three subspecies, on the basis of size and color (*caurinus* from Alaska is newly described, p. 43). Among Atlantic coast migrants

187 were identified as *griseus* and 122 as the inland race *hendersoni*. The number of unidentifiable specimens is not clearly stated, but presumably 196 (118) since the total number of examined Atlantic Coast birds of *griseus* is given as 505 (p. 26) (or 427?, p. 33). These figures illustrate the degree of similarity of these races. Less than ten per cent of the Atlantic Coast dowitchers are Long-bills. Many of the specimens in collections identified as Long-bills actually belong to *hendersoni*, the inland race. Even on migration the Long-bill has preference for fresh water, as was, of course, long known to the late Charles Urner and other experienced field workers.

The Long-bill presumably evolved in the Bering Sea-Yukon Pleistocene refuge (and acquired there its preference for fresh water), while the Short-bill was pushed south. Pitelka believes that the racial divergence within *griseus* antedates the maximum of the Pleistocene glaciation, but the reasoning back of this conclusion is not convincing. The difference between Short-bill and Long-bill is very slight and exceeds in no character (including ecological and voice differences) the amount of difference known to occur within many species of birds. Still, the apparent lack of intergradation in the zone of contact indicates that the two forms have reached species level. The exact quantitative analysis of the material (including statistical evaluation) is a particularly valuable section of this work. It may well serve as a model for other similar studies.—E. Mayr.

Survey of Contemporary Knowledge of Biogeochemistry / 3. The Biogeochemistry of Vertebrate Excretion.—George E. Hutchinson. Bull. Amer. Mus. Nat. Hist., 96: xviii + 554, 16 pls., 56 tables, 103 figs. June 14, 1950. Price, $10.00.—Despite the rather formidable title, this study presents in readable and interesting manner a great mass of information on the various factors influencing the the deposition of guano by vertebrate animals, primarily by birds. Included are such things as the geology, biochemistry, archaeology, and oceanography of the regions in which guano is found.

Of major general interest is the light that this paper throws on climatic changes or shifts during the post-Pleistocene period. For each deposit there is a chemical analysis, data on age, weathering, and rate of deposition.

There is an extensive bibliography and a complete index.—H. I. Fisher.

Recent Publications Noted

A Game Inventory of Alabama.—Frederick S. Barkalow, Jr. (Alabama Dept. Cons., Montgomery), x + 140 pp., 63 figs., 1949.—Of interest to ornithologists is the information pertaining to Bob-whites, Wild Turkeys, Mourning Doves, and waterfowl. Data were gained from censuses taken by use of dogs, driving, questionnaires, sound, plane, and simple observation. The results obtained, in instances where two or more methods were applicable, are compared. There are maps and figures to show distribution and changes in status.

Birds of the Coast.—C. A. Gibson-Hill. (H. F. & G. Witherby Ltd., London), pp. xxxii + 216, many figs. and photos, November 4, 1949. Price, 10/6 net.—This book for field observers includes all common birds of the coast of the British Isles; it is not limited to water birds. In the introduction is an outline of the principal habitat areas, but specific information on habitat is in the species accounts which include the usual material. These accounts are exceptional, however, in that they include outline maps of ranges and seasonal distribution and black and white cuts to show field characters.

There is a glossary of terms used and a table of data on breeding of the various species. In the table are summarized the seasonal status, egg-laying period, clutch size, and duration of incubation, care of young, and the fledgling period.

The very excellent photographs are primarily of water birds.

Songs and Other Sounds of Birds.—Alexander V. Arlton. (A. V. Arlton, Parkland, Wash.), xii + 194 pp. (lithographed) 1949.—This is a compilation of the sounds as interpreted by various workers. All are set down in syllables, and many are also reproduced as musical scores. It is often impossible to correlate the syllables quoted with the recorded notes, and the different scores (pp. 23 and 27) for the drumming of the "Ruffled" (*sic.*) Grouse are confused. It would seem that the publication would have had considerably more value if the observations from the literature had been analyzed and restudied in the light of the excellent recordings (Cornell) to which the author had access.

Birds of the Cleveland Regions.—Edited by Arthur B. Williams. Sci. Publ. Cleveland Mus. Nat. Hist., 10: 1–215, June, 1950. Price, $2.00.—This is a checklist of 330 forms and was compiled by members of the Kirtland Bird Club. All published and personal records, extending back to 1755, have been included. In addition to the usual list information, dates of occurrence, habitat preference, and, for locally breeding species, nesting habits, eggs, and incubation periods are noted. Some data on numbers are included. The area is described and a glossary of place names included. A short section deals with the history of ornithology in this region. There is an index of common and scientific names.

Les Echassiers / de Belgique.—R. Verheyen (Mus. Roy. d'Hist. Nat. Belgique, Brussels), pp. 1–339, 118 figs., 1948.—The birds considered here are members of the Ciconiiformes, Charadriiformes, and Gruiformes.

In the introduction is general material on the adaptations of this "group"—including structure of foot, bill, plumage—and information on locomotion, behavior, nest, eggs, and young. A key to the forms is on pages 56–72 and includes sketches of important identifying features.

In the accounts are described the various plumages, the status, seasonal occurrence of each species, and general biology, sometimes in considerable detail. For certain forms a great deal of natural history information is presented, as in the case of the heron, *Ardea c. cinerea*, pp. 83–102, *Vanellus vanellus*, pp. 155–168, *Tringa t. totanus*, pp. 197–205, *Limosa l. grutto*, pp. 241–249. Of unusual interest is the description of display in many forms. Body weights are frequently given.

A short section on these birds "in folklore and language" is present. There is no index, but the table of contents is complete to species.

List of Danish Vertebrates.—Birds by Bernt Løppenthin. (Danish Sci. Press, Copenhagen), pp. 1–180, folding map. 1950. Price, $1.50.—Pages 68–132 are devoted to a list of birds by subspecies; these accounts include data on abundance and status. Danish common names are given. There is a bibliography of about a page and a complete index. In the Introduction, pages 13 to 17, it may be noted that 343 species (389 forms) are included; 188 species breed in Denmark and 170 to 180 forms migrate through Denmark.

The Breeding-Birds of the Netherlands.—A. L. J. Van Ijzendoorn. (E. J. Brill, Leiden), pp. 1–73, 8 pls., 1 folding map. 1950. Price, 6.25 Guilders.—A brief description of some of the best "birding spots" in Holland precedes the systematic list of the breeding birds. In the list one may find information on relative abundance,

general distribution, and habitat. There is no data on nests, eggs, or dates of occurrence. Changes in status are noted where information is available. One finds that 184 species and four subspecies are included, but that only about 150 forms of 16 orders and 43 families breed regularly. The families represented by 10 or more breeding species include: Anatidae, Sylviidae, Fringillidae, Laridae, Turdidae, and the Scolopacidae.

There is a very brief bibliography; indices are to scientific names and to English and Dutch common names.

A Bibliography of Kentucky Ornithology.—Harvey B. Lovell and Mabel Slack. (Ky. Orn. Soc., Occ. Publ. No. 1, Bowling Green, Ky.), pp. 1–50, 1 map. 1949. Price, $1.00.—This is an annotated list (alphabetical by authors) of all publications relating to the birds of Kentucky through the year 1948. Pages 5 to 15 are devoted to a brief history of Kentucky ornithology which notes the early activities of Michaux, Audubon, Wilson, Beckham, and Pindar, as well as reviewing present day ornithology in the state.

Trapping Methods for Bird Ringers.—P. A. D. Hollom. Brit. Trust Ornith. Field Guide No. 1: 1–40, 24 figs., 1950. Price 2s. 6d.—This interesting booklet consists of diagrams of various bird traps, with brief discussions of methods of use and species that may be obtained with each type. With few minor exceptions, only traps in use in England are included. Thus there is no mention of the efficient Japanese and Italian nets, or of the various successful devices now being operated in America. Bird banders in the United States can perhaps get ideas for traps suitable for their use from this publication which is the first in a series proposed by the British Trust for Ornithology.

Ducks are Different.—Francis J. S. Holmes and Angus H. Shortt. (Holmes, 666 Riverwood Ave., Ft. Garry, Winnipeg), 38 pp., 18 col. pls., 1949. Price, $1.00.—This little booklet gives thumbnail sketches of the more common ducks of the Mississippi Flyway. The colored plates consist of caricatures of ducks, designed to emphasize their distinguishing marks.

Birds Observed and Collected During the Whaling Expeditions of the "Willem Barendz" in the Antarctic, 1946–1947 and 1947–1948.—W. H. Biermann and K. H. Voous. Ardea, 37 (extra no.) : 1–123, 1 pl., 15 figs., 1 folding chart, 1950. In English.—This is far more than the usual list of species observed or collected. There is detailed information on seasonal distribution, structure, weights, reproduction, molt, food habits, and field characteristics. The data obtained on these two voyages are correlated with the findings of previous workers, and much new material is presented.

ADAMETZ, EMILIE. 1950. Die Einwanderung und Ausbreitung der Türkentaube [*Streptopelia d. decaocto*] in Österreich von 1943–1949. Orn. Ber., **2** (2): 85–97.

ALLAN, RONALD M. 1950. Fleas (*Siphonaptera*) from birds in North-east Scotland. Scot. Nat., **62** (1): 33–41, 1 fig., 1 table.

BAL, C. 1950. De nestbouw van Sperwers, *Accipiter n. nisus* (L.), in Nederland. (Nest-building behavior). Ardea, **38** (1–2): 19–34, 10 figs. English summary.

BEHLE, WILLIAM H. 1950. Clines in the Yellow-throats [*Geothlypis trichas*] of western North America. Condor, **52** (5): 193–219, 2 figs., 7 tables.—Critical review and study of variation.

BETTS, A. H. 1950. Rooks [*Corvus monedula*] "hawking" insects. Brit. Birds, **43** (7): 221.

BLOESCH, MAX. 1950. Die Storche in der Schweiz. **Orn. Beob., 47 (3): 126–129,** 3 tables.—Numbers and movement of White Stork.

BOASE, HENRY. 1950. Notes on the behaviour of some ducks. **Scot. Nat., 62 (1): 1–16,** 4 figs.

BRACKBILL, HERVEY. 1949. Age and migration records of Maryland Brown Thrashers. Md. Birdlife, **5** (1): 3–4 (mimeo.).

BRACKBILL, HERVEY. 1950. White-breasted Nuthatch (*Sitta carolinensis*) and Tufted Titmouse hawking for insects. Wilson Bull., **62** (3): 135–136.

BUSSMANN, JOSEF. 1950. Zur Brutbiologie des Wiedehopfes (*Upupu epops*). Orn. Beob., **47** (4): 141–151, 4 figs., 2 pls.—Notes on various aspects of breeding, including growth of young.

BYERS, GEORGE W. 1950. A Black and White Warbler's [*Mniotilta varia*] nest with eight Cowbird eggs. Wilson Bull., **62** (3): 137–138, 2 photos.

CASAL, PEDRO S. 1950. La avutarda de Mar: *Chloëphaga hibrida hibrida* (Molina). Hornero, **9** (2): 167–174, 1 fig., 3 photos.

CHAPLIN, M. 1950. Distraction display of Stonechat [*Saxicola torquata*]. Brit. Birds, **43** (7): 223–224.

COHEN, EDWIN. 1950. Nesting-site used six times in one season. **Brit. Birds, 43** (9): 292.—By Tawny Owls, *Strix aluco*, and by Stork-Doves, *Columba oenas*.

[COLE, LEON J.] 1949. Leon Jacob Cole. Pass. Pigeon, **11** (2): 73–74.

COLLIAS, N. E. 1950. Some variations in grouping and dominance patterns among birds and mammals. Zoologica, **35** (6–11): 97–119, 1 fig., 9 tables.—Intra- and interspecific dominance.

CONOVER, BOARDMAN. 1950. A study of the Spotted Tinamous. **Field. Zool., 31** (37): 339–362.—*Nothura maculosa submontana* (Chos-Malal, Rio Neuquen, Neuquen, Argentina), *N. m. annectens* (Cambaceres, Prov. Buenos Aires, Argentina), *N. m. paludivaga* (Laguna General Diaz, Paraguayan chaco), new subspecies.

CONOVER, BOARDMAN. 1950. A study of the Elegant Tinamous. **Field. Zool., 31** (38): 363–374.—*Eudromia elegans patagonica* (Estacion Pampa Alta, Ferrocarril Patagonica, Terr. Santa Cruz, Argentina), *E. e. multiguttata* (Cambaceres, Prov. Buenos Aires, Argentina), *E. e. devia* (Chos-Malal, Rio Neuquen, Neuquen, Argentina), new subspecies.

COOKE, MAY THACHER. 1950. Returns from banded birds. **Bird-Banding, 21** (4): 145–148.

CRAMP, STANLEY. 1950. Chick survival in the Kittiwake. **Scot. Nat., 62** (1): 63–64.

CRANDALL, LEE S. 1950. Feathered treasures from Ecuador. **Animal Kingdom, 53** (5): 144–151, 161–163, 17 photos.—Excellent photographs, particularly of hummingbirds.

CROSS, FRANK C. 1950. Winter copulation of Mallards [*Anas platyrhynchos*]. Wilson Bull., **62** (3): 133.

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DARLING, BETTY. 1950. Death of a Horned Lark [*Eremophila alpestris praticola*] in territorial combat. Wilson Bull., **62** (3): 134–135.

DAVIS, T. A. W. 1950. Notes on birds seen in winter between the English Channel and the West Indies. Brit. Birds, **43** (7): 218–221.

DE BEAUFORT, L. F. 1950. In memoriam A. A. van Pelt Lechner. **Ardea, 38 (1–2):** 84–85, 1 pl.

DEIGNAN, H. G. 1950. Five new races of birds from Southeastern Asia. Zoologica, **35** (6–11): 127–128.—*Gecinulus grantia poilanei* (Prov. of Bien Hoa, Cochin-China); *Conostoma oemodium graminicola* (Ndamucho, Yunnan Prov., China); *Malacopteron affine phoeniceum* (Segah River, eastern Borneo); *Geokichla citrina gibson-hilli* (Merqui Dist., Tenasserim Div., Burma); *Anthreptes singalensis stellae* (Khao Saming, Trat Prov., se Siam).

DE RUITER, L. COOMANS. 1950. Vogels van het Quarles-Gebergte (ZW. Centraal Celebes). Ardea, **38** (1–2): 40–64.—Species accounts of birds in Celebes.

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DUMAS, PHILIP C. 1950. Habitat distribution of breeding birds in southeastern Washington. Condor, **52** (5): 232–237, 1 table.—Density indices of birds in various habitats.

DUPOND, CH. 1949. Deux propositions taxidermiques pour les collections ornithologiques. Gerfaut, No. **4**: 238–244.

EVENDEN, FRED G. JR., DAVID B. MARSHALL AND THOMAS H. MCALLISTER, JR. 1950. Waterfowl populations of a swamp in Western Oregon. Condor, **52** (4): 159–163.

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FLANIGHAN, M. 1950. Under-water movements of Moorhen (*Gallinula chloropus*). Brit. Birds, **43** (7): 228.

FRIEDMANN, HERBERT. 1950. The birds of North and Middle America. Part XI. U. S. Nat. Mus. Bull. 50, 793 pp., 51 figs.—Includes the Cathartidae, Accipitridae, Pandionidae, and Falconidae. Format and content as in previous parts.

GEBHARDT, LUDWIG. 1950. 20 Jahre Kontrolle eines hessischen Schwarzspechtreviers [*Dryocopus martius*]. Vogelwelt, **71** (4): 105–110.

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GIAI, ANDRES G. 1950. Notas de Viajes. Hornero, **9** (2): 121–164, 6 figs., 8 photos.

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GODFREY, W. EARL. 1950. Description of a new northwestern *Geothlypis*. Can. Field-Nat., **64** (3): 104.—*G. trichas yukonicola* (Jarvis River at Alaska Highway, Yukon Terr.), new subspecies.

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HOBBS, JOHN T. 1950. Display of House-Martin [*Delichon urbica*]. Brit. Birds, 43 (8): 256–257, 2 figs.

HODGES, JAMES. 1950. Unusual display of Mourning Doves. Bird-Banding, 21 (3): 115.

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HORNBERGER, F. 1950. Uber die Storche in Baden und Wurttemberg und das Storungsjahr 1949. Orn. Beob., 47 (3): 98–108, 2 figs., 4 tables, 1 map.—Breeding numbers and disturbances of the White Stork.

HORNBERGER, FRIEDRICH. 1950. Uber Storchzahlungen in Deutschland und Osterreich. Orn. Beob., 47 (3): 108–126, 6 figs., 4 tables.—Populations and changes in status of the Stork.

HULME, DEREK C. 1950. Chaffinch [*Fringilla coelebs*] mimicking Hedge-Sparrow's [*Prunella modularis*] song. Brit. Birds, 43 (7): 222.

JONES, J. KNOX, JR. 1949. Notes on the small mammal contents of pellets of the Barn Owl (*Tyto alba pratincola*) in Nebraska. Nebr. Bird Rev., 17 (1–2): 4–5, 1 table.

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OBITUARIES

EDWARD AVERY MCILHENNY, Honorary Life Associate Member of the American Ornithologists' Union, died at his home at Avery Island, Louisiana, on August 8, 1949. He was born there on March 29, 1872, the son of Edmund McIlhenny and Mary Avery McIlhenny, both of whom were members of distinguished Louisiana families. Young "Ned" spent much of his early life acquiring an intimate knowledge of the denizens of the vast marshes surrounding his home, and from that knowledge sprang an insatiable love of nature that was to lead, in later life, to his recognition as one of America's leading conservationists and most enthusiastic naturalists.

The explorer instinct early manifested itself in the young naturalist, for at the age of 21 he withdrew from Lehigh University to accompany Dr. Frederick A. Cook to the Arctic, and he was with Cook on the "Miranda" when that ship was wrecked off the coast of Greenland. Three years later, in August, 1897, he went north on his own expedition to Point Barrow, Alaska, for the purpose of collecting birds and their nests, mammals, and ethnological materials. This was the fateful winter during which over 100 sailors from several ice-bound whaling ships were forced to spend the winter at this northernmost North American outpost. The cotton which McIlhenny had taken with him for use in preparing specimens was utilized in the making of bed-covers, the fabrication of which by the idle sailors provided both busy-work and sleeping warmth.

Back at the Avery Island estate, McIlhenny soon set in operation certain wildlife management practices of his own device that resulted in a veritable paradise for ducks, geese, herons, and other waterbirds. Indeed, his work in creating an artificial pond with nesting platforms and racks of suitable nesting materials led to the establishment of one of the largest heron rookeries on record, and one that was to be known throughout the world as "Bird City." McIlhenny not only conducted original researches into the life history and habits of certain birds and published articles in ornithological journals setting forth the results of these studies, but also he patronized extensively the works of a number of his ornithologist friends. He contributed generously to the operational expenses of the A. O. U., as well as to certain museums. Aside from his studies of the Snowy and American Egrets, the Boat-tailed Grackle, and the Sandhill Crane, he was the author of numerous books, short articles, and notes that contributed materially to Gulf Coast ornithology. Possibly one of his greatest contributions to ornithology was, however, his laborious and long-continuing bird-banding operations that culminated in the banding during his lifetime of the phenomenal number of 189,298 birds.—GEORGE H. LOWERY, JR.

MAX MINOR PEET, elected an Associate of the American Ornithologists' Union in 1933 and a Member in 1948, died suddenly in Ann Arbor, Michigan, on March 25, 1949. Dr. Peet was born in Iosco, Michigan, on October 20, 1885. He very early showed an interest in ornithology and even before he began his college training accompanied a University of Michigan zoological expedition to northern Michigan. After receiving the Doctor's Degree in Medicine from the University of Michigan (1910), he served successively at Rhode Island Hospital, the University of Pennsyl-

vania, and the Philadelphia General Hospital. In 1916 he was called to the University of Michigan, where he was appointed Chief of the Neurological Division of the University Hospital (1918) and Professor of Surgery (1930). Dr. Peet's contributions to the science of neural surgery soon made him one of the world's most distinguished practitioners in that field. His articles in medical journals alone would ensure his lasting eminence. Yet, with all this, Dr. Peet was among his generation's most active ornithologists. His study (1908) of the ecology of the birds of the Ypsilanti bayou is one of the earliest important studies in avian ecology. In addition he wrote three major articles on the birds of Isle Royale and the Porcupine Mountains and a number of shorter notes on bird distribution and taxonomy. The western form of American Bittern and the Chiapas Black-headed Saltator were named in his honor. In 1932, Dr. Peet accompanied the University of Michigan expedition to study the Colima Warbler in the Chisos Mountains, and from each of his many trips to medical conventions and to far places for special operations and medical consultations he returned with some new ornithological specimens or data. His collection of birds, housed in the University of Michigan Museum of Zoology, was perhaps the finest private collection of the birds of the A. O. U. Check-list area. Dr. Peet's family has generously presented the collection to the University of Michigan. —Josselyn Van Tyne.

Percy Roycroft Lowe, Honorary Fellow of the American Ornithologists' Union, elected in 1920, died in Burley, Hampshire, England, August 18, 1948. He was born at Stamford, Lincolnshire, January 2, 1870. After training for the medical profession at Cambridge, he was in institutional service until 1899 when he became a civil surgeon in the Boer War. While in the field, he developed an interest in birds that became all-absorbing. Following the war he became private physician to Sir Frederic Johnstone and accompanied him on six annual voyages to the West Indies. He collected during this period approximately 3,000 birds, chiefly insular forms.

In 1919 he succeeded W. R. Ogilvie-Grant and took charge of the Bird Room in the Natural History Museum. His deep interest in the anatomy and classification of birds soon brought him an international reputation. The investigations made by him on the Charadriiformes did much to elucidate the relationships of the various groups within this order. He also did some notable work on the ostriches, frigate birds, peacock pheasants, and penguins. An examination of the gallinaceous bones dating from the period when the Romans occupied England showed that they were all referable to the domestic fowl (Ibis, ser. 13, 3: 332–343, 1933). There was no osteological evidence that the Pheasant was present at this time.

Dr. Lowe was interested greatly in bird protection and in 1938 became chairman of the European section of the International Committee for Bird Preservation. In 1939 he was awarded the Verner von Heidenstam Gold Medal of the Swedish Academy of Sciences for his work on the protection of wildfowl. He was president of the British Ornithologists' Union from 1938–1943, and in 1946 was given the Salvin-Godman Medal of the Union for his particularly meritorious work in ornithology.

He was married to Harriette Dorothy in 1924. His widow and a daughter survive him.—A. W. Schorger.

Reinhold Leo Fricke, an Associate of the American Ornithologists' Union died suddenly at his home in Rosedale, near Pittsburgh, Pa., April 20, 1948, at the age of 48. Hr was born in Buffalo, N. Y., July 6, 1900 and served five years in the Navy during World War I. In 1926 he received an appointment in the Carnegie Museum at Pittsburgh as a preparator in the Department of Education. Here he prepared

many groups of small mammals and birds for circulation by the museum through the public schools.

During the 20 odd years of his connection with the museum he made numerous field trips and brought back many specimens of mammals and birds for the collections. In the nearby Pymatuning Lake district he made new discoveries which were duly recorded in Todd's 'Birds of Western Pennsylvania.' He accompanied W. L. Mellon on a cruise on the yacht 'Vagabondia' around South America. In 1936 he made a trip with J. K. Doutt to investigate the hitherto unknown avifauna of the Twin Islands in James Bay, and in the summer of 1947 he accompanied Edward J. Flesher of Pittsburgh on a trip to the west and secured specimens of mule deer and elk on which he was working at the time of his death.

Fricke was elected an associate of the Union in 1927. His last big undertaking was the preparation and installation of the case of mammals of Pennsylvania in the Children's Museum.—T. S. PALMER.

Corresponding Fellow ARTHUR HERBERT EVELYN MATTINGLY, Melbourne, Australia, died October 1, 1950.

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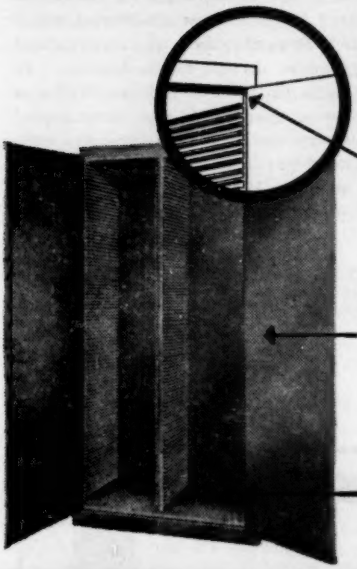

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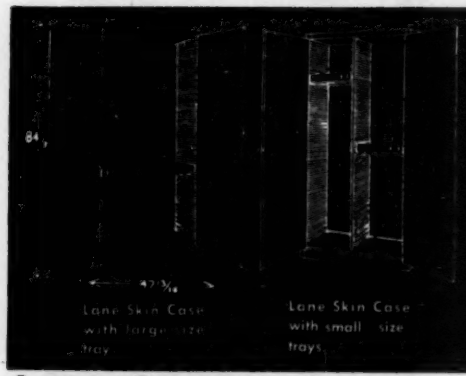

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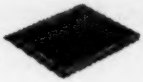

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